Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
Appropriate Framework for Broadband Access to the Internet over Wireline Facilities	)	CC Docket No. 02-33
Universal Service Obligations of Broadband Providers	)	
Computer III Further Remand Proceedings: Bell Operating Company Provision of Enhanced Services; 1998 Biennial Regulatory Review – Review of Computer III and ONA Safeguards and Requirements	)	CC Docket Nos. 95-20, 98-10

BROADBAND FACT REPORT

March 1, 2002

INTRODUCTION AND SUMMARY

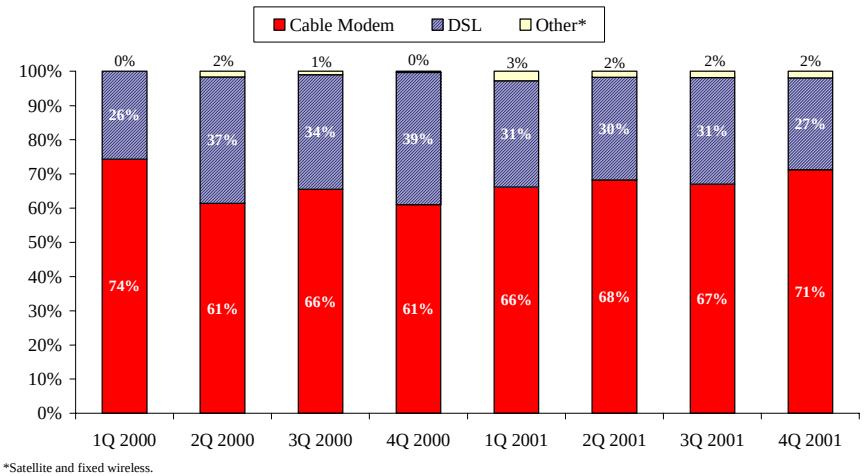
Today, there are four main technologies used to provide broadband services to mass-market consumers: cable modem, digital subscriber line (DSL), satellite, and fixed terrestrial wireless. Each of these technologies is backed by significant industry players. Cable modem service is being deployed widely by each of the nation's largest cable operators, which serve nearly 70 percent of U.S. homes. DSL is being deployed by local telephone companies. The nation's two largest DBS providers – Hughes and EchoStar – have both deployed two-way broadband satellite services. WorldCom and Sprint are two of the largest owners of fixed wireless spectrum.

Both consumers and providers view each of the various broadband services as interchangeable. Indeed, each of these services offers the same functionality, and is used primarily for high-speed Internet access. Moreover, these services – with the possible exception of satellite – are generally priced at the same levels. Satellite is newer than the other broadband services, however, and the price for two-way broadband satellite service has already begun to decline.

Two or more of the main broadband technologies are frequently available in the same geographic areas. For example, analysts estimate that approximately one-third of all U.S. households currently have access to both cable modem and DSL service. About three-quarters of all homes with access to DSL also have access to cable modem service. Broadband satellite service is available to almost all U.S. homes.

For all these reasons, the provision of broadband services has all the makings of a fully competitive market. Nonetheless, cable is the clear leader in the broadband market today, by a wide and growing margin. As of year-end 2001, there were 7.5 million cable modem subscribers in the U.S., compared to 3.3 million residential DSL subscribers, and approximately 100,000 broadband satellite and fixed wireless subscribers. And cable not only has a large lead already, but also continues to add new subscribers at a faster rate than competing broadband technologies. *See* Figure A.

Figure A. Market Share of New Residential Broadband Subscribers

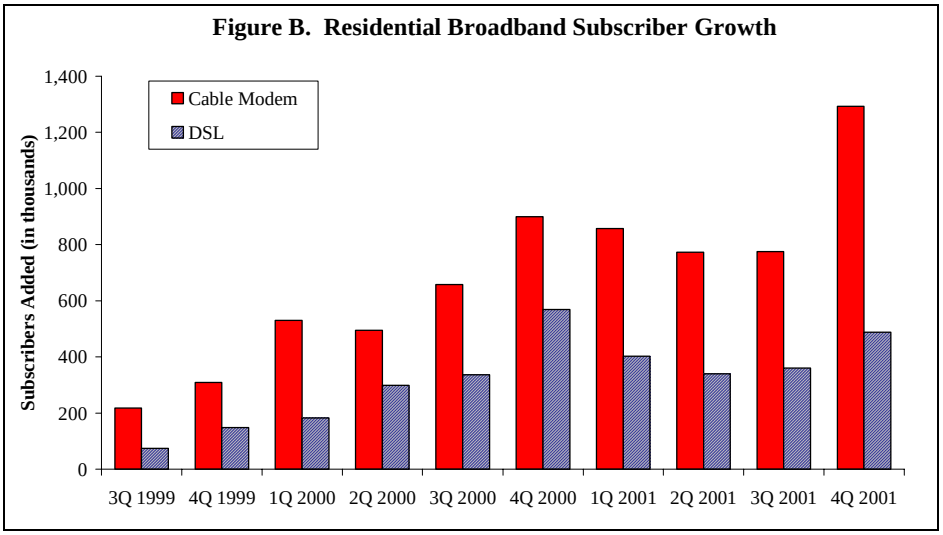


*Satellite and fixed wireless.

Although DSL is an attractive technology with which telephone companies can enter the broadband business, ILECs will need to make significant additional investments in order to expand broadband availability over the long term. This will likely involve deploying a great deal of new fiber-optic facilities and associated electronics. The current regulatory environment greatly reduces the incentive to make these upgrades, however. Although ILECs are minority players in the broadband market, both ILEC retail and wholesale broadband services are heavily regulated, while the ILECs' main broadband competitors (including cable) operate without any such restrictions.

While there still are significant regulatory obstacles to broadband deployment, the need to spur such deployment is more urgent than ever. It has been nearly five years since the first commercial deployment of mass-market broadband service. Since that time, there has been limited penetration of broadband. Today, there are only 11 million residential broadband subscribers, which represents about 10.5 percent of all U.S. homes. And subscriber growth is not nearly as rapid as should be expected given the enormous demand for broadband and the fact that the market is still so new. *See* Figure B.

Figure B. Residential Broadband Subscriber Growth



Many new technologies evolve in a so-called "S-curve": a long period of slow growth, followed by a relatively short period of steep growth, followed by additional slow growth as the market approaches saturation. It is widely accepted that broadband will, eventually, achieve steep growth. And it also is widely believed that this growth will create enormous consumer benefits, and will greatly stimulate the U.S. economy. It is much less settled when this growth and concomitant benefits will actually arrive.

The artificial regulatory deterrents to investment affect the deployment of broadband services not only to mass-market customers, but to large business customers as well. As with mass market broadband, large business broadband is a competitive market. Frame Relay and ATM are the two main large business broadband services, and AT&T, WorldCom, and Sprint control more than two-thirds of the revenues for these services. The many facilities-based competitors in the large business broadband market ensure that there is more than adequate capacity at current levels of demand. But demand for broadband in the large business market is

growing very quickly, and in order to satisfy this demand enormous new investment will be required. According to one analyst, $50 billion dollars in new investment will be needed over the next five years in order to prevent U.S. Internet traffic from grinding to a halt.

It is clear from past experience that reducing regulatory obstacles to the deployment of new facilities, and granting equal regulatory treatment to all competing providers of comparable services, greatly increases output. This is exactly what has happened in the wireless industry. As is the case with broadband today, the early years of the wireless industry were characterized by a limited number of competitors, many of which faced extensive regulation that created an uneven competitive playing field. As that industry was deregulated, however, wireless investment, subscribers, and output exploded. The same thing happened with the deregulation of computers and other customer premises equipment, as well as with the Internet and other information services. These precedents provide strong evidence that deregulating the nascent, competitive broadband market will boost investment, increase output, and benefit consumers.

I. MASS MARKET BROADBAND.

A. Overview of Mass Market Broadband Alternatives.

There are four main technologies currently being used to provide high-speed Internet access and other broadband services to mass market consumers: cable modem, digital subscriber line (DSL), satellite, and fixed terrestrial wireless.

Cable Modem. Cable modem service is provided over cable networks with two-way capabilities.[1] Cable networks pass more than 90 percent of the 106 million households in the U.S.,[2] and approximately three-quarters of all households passed by cable are passed by networks that now have two-way capabilities.[3] Most two-way cable networks are being used to provide cable modem service.[4] According to analysts, cable modem service is actually being offered today to between 50 and 66 percent of all U.S. homes.[5] The nation's seven largest cable operators – AT&T Broadband, Time Warner, Comcast, Charter, Cox, Adelphia, and Cablevision, – serve more than 80 percent of all cable subscribers, and approximately 90 percent of all cable modem subscribers.[6]

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[1] Two-way cable networks typically use a hybrid fiber-coaxial (HFC) architecture, which involves stringing fiber between the cable operator's "headend" (where connections to the Internet or other data networks are made) and "nodes" within each individual neighborhood, and then using traditional coaxial cable (boosted with new, high-powered amplifiers) to connect these fiber nodes to homes. *See, e.g.*, McKinsey & Co. and JP Morgan H&Q, *Broadband 2001* at 38 (Apr. 2, 2001) ("*Broadband 2001*"). There may be anywhere from 50 to 500 homes that share a single node, and the size of that node, as well as the number of users connected to it at any one time, determines the amount of bandwidth available to each individual user. *Id.*

[2] *See* NCTA, *Industry Statistics*, http://www.ncta.com/industry_overview/indStat.cfm?indOverviewID=2; (homes passed by cable as of December 2001) (citing Paul Kagan Associates, Inc.); T.A. Jacobs, J.P. Morgan H&Q, *Telecom Services 2001* at Table 15 (Nov. 2, 2001) (U.S. households in 2001).

[3] *Broadband 2001* at Table 6.

[4] There are more than 90 cable operators that offer cable modem service to their subscribers. *See* Cable Datacom News, *Commercial Cable Modem Launches in North America*, http://cabledatacomnews.com/cmic/cmic7.html (updated Mar. 7, 2001); *see also Over 90% of Cable MSOs Now Offer Broadband Internet*, BroadbandWeek.com, http://www.instat.com/rh/bbw/mb0102dc.htm ("[O]ver 90% of the 48 U.S. cable MSOs surveyed recently by Cahners In-Stat Group now offer high-speed Internet service, up sharply from 32% in late 1999.").

[5] M. Goodman, Yankee Group, *Residential Broadband: Cable Modems and DSL Reach Critical Mass*, Media and Entertainment Strategies, Vol. 5, No. 3 at 4 (Mar. 2001) ("*Yankee Group Critical Mass Report*") ("Overall, approximately 50% of U.S. households have cable modem service available at year-end 2000"); I. Khan, *et al.*, Yankee Group, *Cable Modem Providers Continue to Lead the High-Speed Internet Charge: The Yankee Group's Predictions on Consumer Broadband Services*, Consumer Market Convergence, Vol. 18, No. 11 at 4 (Aug. 2001) ("*Yankee Group Consumer Broadband Predictions Report*") ("At year-end 2001, approximately 66% of the households in the United States will have cable modem service available to them."); *see also* NCTA, *Industry Statistics*, http://www.ncta.com/industry_overview/indStat.cfm?indOverviewID=2 (70 million homes passed by cable modem service as of November 2001).

[6] NCTA, *Top 25 MSOs*, http://www.ncta.com/industry_overview/top50mso.cfm (as of June 30, 2001); NCTA, *Industry Statistics*, http://www.ncta.com/industry_overview/indStat.cfm?indOverviewID=2; R.A. Bilotti, *et al.*, Morgan Stanley, Dean Witter, *Cable Modem and xDSL Conference Call* at Exh. 3 (Jan. 18, 2002) ("*Morgan Stanley Cable Modem/xDSL Conference Call Report*") (cable modem subscribers as of 4Q 2001).

Cable operators also are beginning to extend their cable networks to provide high-capacity loops to serve small and medium-sized business customers. This push is being driven by the advent of next-generation Voice-over-Internet-protocol technology, which has "solved" "previous difficulties such as [Quality of Service] problems, incompatible and incomplete standards, and lack of equipment."[7] Today, "[b]usiness trials of [Fiber to the Business] are underway . . . with deployment expected this spring."[8] Numerous cable operators already have realized that there are many businesses that lie in close proximity to their networks, and that it makes sense to build out their networks incrementally to serve them.[9]

DSL. DSL is provided over the existing local telephone network by connecting digital modems over copper loops to the central office, and then ensuring that those loops are free from various electronics (*e.g.*, load coils) that benefit voice service but that inhibit the provision of data services.[10] DSL service can be provided efficiently at high speeds only on loops that are 18,000 feet or shorter,[11] which means that "only about two-thirds of U.S. homes are easily addressable for xDSL."[12] At present, DSL is actually available to only about 40 percent of U.S. homes.[13]

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[7] TIA Press Release, *Cable's Fiber to the Business Deployment Spurred by VOIP* (Feb. 14, 2002).

[8] *Id.*

[9] *See, e.g.*, G. Lawyer and C. Wolter, *The Cable Giant Stirs*, Sounding Board Magazine (Dec. 1, 2001), http://www.soundingboardmag.com/articles/1c1vox.html (quoting Geoff Tudor, president and CEO, Advent Networks: "Cox realized there were 300,000 small businesses within 50 feet of their coaxial drops, easily reachable. . . That could greatly expand the network's revenue-generation potential."); C. Weinschenk, *Cable Makes Advances Into CLECs' Wake*, Multichannel News (Dec. 3, 2001) (Charter likewise has, in addition to over 1,300 small and medium-sized business customers, fiber connections to approximately 400 businesses; these 400 businesses serve approximately 3,200 home workers with VPNs); M. Reilly, *New Cable Modem Target: Businesses*, Citybusiness at 3 (May 18, 2001) (Michael Fox, vice president and general manager of Time Warner Cable in Minneapolis, said roughly 50,000 businesses were located within range of the company's cable service area, though one-third of the businesses already signed up needed some sort of network buildout. However, "[i]t made a lot of sense to expand into the business sector.").

[10] There are two main variations of DSL: asymmetric (ADSL), which has a higher downstream than upstream transmission rate; and symmetric (SDSL), which offers an equal downstream and upstream rate. ADSL is the most common form of DSL, and is used most often with residential customers, whereas SDSL is used primarily for business customers. *See Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable And Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, Second Report, 15 FCC Rcd 20913, ¶¶ 36-37 (2000) ("*Second Advanced Services Report*").

[11] *See, e.g.*, A. Gilroy & L. Kruger, *Broadband Internet Access: Background and Issues*, Congressional Information Service – Policy Papers (July 3, 2001); D. Sweeney, *Ultra Long-Reach DSL : A Whole New Crop of Companies Aims To Boost DSL Performance*, America's Network (Sept. 15, 2001).

[12] *Broadband 2001* at 40.

[13] *See, e.g.*, J. Bazinet & D. Pinsker, JP Morgan H&Q, *The Cable Industry* at Figures 12 & 36 (Nov. 2, 2001) ("*JP Morgan Cable Industry Report*") (estimating that DSL is available to approximately 43 percent of households as of 1Q 2001); P. Roche, *DSL Will Win Where It Matters*, McKinsey Quarterly 2001, No. 1 (2001) ("At present, about 40 percent of all phone lines are ready for DSL, while 58 percent of all households can order broadband over cable.").

Satellite. Broadband satellite services are provided using the same constellation of Direct Broadcast Satellites (DBS) that currently provide video services to more than 17 million subscribers.[14] These geostationary satellites operate in the Ku-band and have broad geographic footprints that enable them to provide service to virtually all U.S. homes.[15] Until recently, the only high-speed satellite services available used a narrowband telephone line as the upstream return path.[16] In late 2000, two satellite providers – StarBand[17] and Hughes – began providing two-way broadband services.[18] In the next few years, several additional two-way broadband satellite services using the Ka-band are expected to become available.[19]

Satellite providers have designed services offering specifically targeted at small business customers. For example, Hughes offers DirecWay service, which is an Internet access service that gives "small business[es] access to the same advanced technology that powers global enterprises."[20] The DirecWay service gives business customers the option of much higher

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[14] *Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, Eighth Annual Report, 17 FCC Rcd 1244, App. C at Table C-1 (2002) ("*Eighth Video Competition Report*"); SkyReport, *National DTH Counts: November 2000 – November 2001*, http://www.skyreport.com/dth_us.htm.

[15] *See* Yankee Group, *Residential Broadband: Competition Arrives Via Satellite*, Media and Entertainment Strategies, Vol. 4, No. 18 (Dec. 30, 2000) ("*Yankee Group Satellite Broadband Report*"); *Broadband 2001* at 45 (a "true advantage" satellite data services have over wireline alternatives is "instant near-ubiquity").

[16] *See Applications for Consent to the Transfer of Control of Licenses and Section 214 Authorizations by Time Warner Inc. and America Online, Inc., Transferors, to AOL Time Warner Inc., Transferee*, Memorandum Opinion and Order, 16 FCC Rcd 6457, ¶ 66 (2001) ("At present, satellite-based Internet access services can supply high-speed transmission only in the 'downstream' direction, that is, from the Internet to the end user's home; the end user must use narrowband telephone lines for the 'upstream' transmission of data from the home to the Internet.") ("*AOL/Time Warner Order*").

[17] StarBand is owned by Gilat Satellite Networks, Microsoft, and EchoStar. StarBand, *Who We Are*, http://www.starband.com/whoweare/index.htm; S. Hinden, *An Out-of-This World Effort for StarBand*, Washtech (Nov. 13, 2000), http://www.washtech.com/washtechway/1_21/techcap/4883-1.html.

[18] DirecPC's Satellite Return System offers download speeds of up to 400 kbps with upload speeds of roughly 128 kbps, whereas StarBand's service offers download speeds of up to 500 kbps with upload speeds of up to 150 kbps. *Compare* Hughes Network Systems Press Release, *Hughes Network Systems Ships Two-Way Direc-PC® Systems* (Dec. 21, 2000) *with* StarBand, *Q&A;Benefits*, http://www.starband.com/faq/benefits.htm#speed. Until late 2000, DirecPC offered one-way satellite service (satellite high-speed downloads at up to 400 kbps with telephone line return path at normal modem speeds). In late 2000, DirecPC began offering two-way satellite service (DirecPC Satellite Return System) that combined downloads at up to 400 kbps with upload speeds of roughly 128 kbps. Hughes Network Systems Press Release, *Hughes Network Systems Ships Two-Way Direc-PC® Systems* (Dec. 21, 2000).

[19] *See, e.g., Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, Seventh Annual Report, 16 FCC Rcd 6005, ¶ 78 (2001) ("*Seventh Video Competition Report*") ("A number of video providers and programmers have financial interests in WildBlue (formerly called iSKY), a satellite company that intends to use Ka-band spectrum and spot-beam technology to deliver two-way, high-speed data to residential markets beginning in late 2001."); *Yankee Group Satellite Broadband Report* at 8 (Astrolink plans to initially market Ka-band satellite broadband service for corporate and governmental communications, with consumer Internet access becoming available in the future. Cyberstar plans to construct a satellite based broadband delivery system that will offer consumer Internet access.).

[20] DirecWay, *For Small Business*, http://www.hns.com/direcway/for_small_business/learn_more/overview.htm.

throughput and downstream bandwidth than is available with Hughes's basic consumer offering.[21] WorldCom began reselling Hughes's DirecWay Service to small- and medium-sized business customers in January 2002, and rebranding that service with WorldCom's name.[22]

Fixed Terrestrial Wireless. Fixed wireless uses high-frequency spectrum to transmit data (and voice) signals to a stationary transceiver up to several miles away.[23] The main fixed wireless services provided to residential customers use Multichannel Multipoint Distribution Service ("MMDS"), which uses spectrum in the 2 GHz band.[24] WorldCom and Sprint "own most MMDS spectrum in the United States," and "have commercially deployed MMDS in a handful of markets."[25] Several companies also plan to offer residential broadband services using unlicensed spectrum bands, including the 2.45 GHz Industrial-Scientific-Medical (ISM) band and the 5.8 GHz Unlicensed National Information Infrastructure (UNII) band.[26]

B. There is Head-to-Head Competition Between the Mass Market Broadband Alternatives.

In determining whether two or more services compete, both the FCC and the Department of Justice focus exclusively on whether those services are substitutes from a demand-side (*i.e.*, consumer) perspective.[27] In analyzing whether two or more services are demand substitutes,

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[21] There are three service plans for business service: Business Basic (500 MB throughput, up to 400 kbps downstream); Business Plus (800 MB throughput, up to 750 kbps downstream); Business Premium (1000 MB throughput, up to 1000 kbps downstream). DirecWay, *For Small Business*,http://www.hns.com/direcway/ for_small_business/learn_more/business_edition. htm.

[22] WorldCom's service will be available in 600 kbps, 800 kbps, or 1 Mbps download speeds, with 128 kbps upload speeds. WorldCom's service level agreement with Hughes guarantees an upload speed of 128 kbps. J. Wagner, *WorldCom Is Now Truly Long Distance*, ISP News (Nov. 27, 2001), http://www.internetnews.com/isp-news/article/0,,8_929181,00.html.

[23] *See Second Advanced Services Report* ¶ 43.

[24] *See Broadband 2001* at 131.

[25] *Broadband 2001* at 47. In October 2001, Sprint announced the end of customer acquisition for MMDS services, and a freeze on the number of MMDS markets served "until substantial progress is made on second-generation MMDS technology. The current MMDS customer base will be maintained, as will all video services offered through the fixed wireless spectrum." Sprint Press Release, *Sprint to Terminate ION Efforts* (Oct. 17, 2001).

[26] *See Broadband 2001* at 49 ("A host of small start-ups are deploying some limited services over unlicensed bands, and some larger providers are running unlicensed spectrum trials."); S. Buckley, *MMDS Hits the Airwaves*, Telecommunications Magazine (Feb. 2001) ("IGI Consulting predicts that by 2005, there will be at least 1000 unlicensed wireless ISPs in operation and 1.3 million subscribers. . . . Unlike licensed MMDS holders that are restricted by the FCC's stringent rules, unlicensed carriers such as Clearwire, Fuzion Wireless and PSInet can set up shop immediately.").

[27] *See, e.g., Regulatory Treatment of LEC Provision of Interexchange Services Originating in the LEC's Local Exchange Area and Policy and Rules Concerning the Interstate, Interexchange Marketplace*, Second Report and Order in CC Docket No. 96-149 and Third Report and Order in CC Docket No. 96-61, 12 FCC Rcd 15756, ¶ 41 (1997) ("our new approach will rely exclusively on demand considerations to define the relevant product market, rather than supply substitutability."); United States Dep't of Justice Antitrust Div., and Federal Trade Commission, 1992 Horizontal Merger Guidelines § 1.11, 57 Fed. Reg. 41552 (1992). *See also Brown Shoe Co. v. United States*, 370 U.S. 294, 325 (1962) ("The other boundaries of a product market are determined by the reasonable

courts and the FCC have considered various factors, including whether the services are functionally similar;[28] whether they are viewed as substitutes by consumers and providers;[29] and whether they are priced similarly.[30] Applying those criteria here, it is clear that cable modem, DSL, fixed wireless, and satellite service all compete directly with one another where those services are available in the same geographic area.

First, each of these four services is functionally similar.[31] Each is used primarily for Internet access; each can be used with an ordinary personal computer, with a modest hardware addition; each provides an always-on connection, at comparable speeds; and unlike traditional dial-up connections, each enables consumers to use their ordinary telephone line for voice or fax while simultaneously accessing the Internet.[32]

Table 1. Functional Similarity of Residential Broadband Services

	"Always On"	**Downstream Speed**			**Upstream Speed**			**Required Hardware (in addition to PC and Ethernet Card)**
		Min.	*Max.*	*Typical*	*Min.*	*Max.*	*Typical*	
Cable Modem	Yes	128k	2M	500k-1M	128k	384k	128k-256k	cable modem
ADSL	Yes	256k	1.5M	500k	128k	768k	128k-256k	digital modem
Two-Way Satellite	Yes	150k	500k	500k	40k	128k	128k	satellite modem; satellite dish
Fixed Wireless	Yes	128k	2M	1M	100k	500k	256k	wireless modem; wireless transceiver

Sources: See Appendix.

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interchangeability of use [by consumers] or the cross-elasticity of demand between the product itself and substitutes for it.").

[28] *See, e.g., Rig Telephones, Inc. d.b.a. Datacom and Stratos Offshore Telephone Company, For Consent to Transfer Control of Microwave and Other Licenses*, Order, 15 FCC Rcd 19745, ¶¶ 16, 21 (2000) (finding that, because there was "no significant functional difference for end users between radio systems operating on common carrier microwave channels and those operating on private microwave channels," the two products were in the same product market).

[29] *See, e.g., Application of WorldCom, Inc. and MCI Communications Corporation for Transfer of Control of MCI Communications Corporation to WorldCom, Inc.*, Memorandum Opinion and Order, 13 FCC Rcd 18025, ¶ 83, n.246 (1998) (considering how providers view the interchangeability of the products) ("*WorldCom/MCI Order*"); *see also id.* (considering how end users viewed the interchangeability of the product).

[30] *See, e.g., Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993*, Third Report, 13 FCC Rcd 19746, 19777 (1998) (noting that the key variable for consumer substitution between wireless and wireline systems is the relative pricing).

[31] *See, e.g., AOL/Time Warner Order* ¶¶ 64-67 (noting that cable modem, DSL, satellite, and fixed wireless are the main broadband technologies used to provide high-speed Internet access).

[32] *See, e.g.*, ibuybroadband.com, *Broadband 101: Everything You Need to Know about Broadband*, http://www.ibuybroadband.com/ibb2/knowledge.asp#whatis ("The first advantage of broadband is that it generally avoids the hassles associated with dialup connections. With most forms of broadband, you can surf the 'net freely, without worrying about tying up your phone line or using up a precious allotment of hours.").

Second, consumers view these four services as interchangeable. As one analyst has explained, "most customers don't care about technologies," but are "platform agnostic," and simply "want an experience that is better than narrowband dial-up."[33] One poll found "little difference between perceptions among those planning to get either DSL or cable modem services."[34] Satellite and fixed-wireless technologies have begun to take market share away from cable and DSL,[35] and they are expected to do so at an even greater rate in the future.[36]

Third, providers of these four broadband services view them as substitutes. For example, cable operators have stated that they view DSL as their main competitor,[37] whereas DSL providers have said the same thing about cable modem providers.[38] Indeed, cable companies have refused to sell advertising time to DSL providers on the grounds that DSL is a direct

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[33] *Broadband 2001* at 37; *see also* K. Greene, *Coming Eventually: TV on the PC*, Broadcasting and Cable at 88 (Dec. 11, 2000) ("There's an ongoing fight about who is better . . . But it comes down to this: Nobody cares. People just want broadband.") (quoting Mark Zohar, research director for Forrester Research); P. Harvey, *Skip the Last Mile*, Business 2.0 (Oct. 1999), http://www.business2.com/articles/mag/0,1640,13154,FF.html (Peter Jarich, Strategis Group: "The consumer doesn't care how they get the bandwidth. . . They don't care if it's delivered via copper wire, fiber, radio waves, or transmitted using two cans and a string – they just want predictable, reliable service."); M. Pastore, *DSL May Find Opportunity in Digital TV*, ISP-Planet (Sept. 27, 2001), http://www.isp-planet.com/research/2001/dsl_010927.html ("It's all about the last mile and consumers don't care if it's copper or coaxial. Broadband access just needs to be fast and reliable.").

[34] M. Pastore, *Cable or DSL? Consumers See Little Difference*, Cyberatlas (Dec. 1, 2000), http://cyberatlas.internet.com/markets/broadband/article/0,1323,10099_523681,00.html (citing Harris Interactive Consumer TechPoll).

[35] *See, e.g.*, *Broadband 2001* at Table 9; *id.* at 47 (Sprint's and WorldCom's MMDS offerings have "captur[ed] a few percentage points of the total residential broadband market"); N. Gupta *et al.*, Salomon Smith Barney, Cable and Telecommunications Services, *The Battle for the High-Speed Data Subscriber: Cable vs. DSL*, at Figure 1 (Aug. 20, 2001) ("*Salomon Smith Barney Battle for High-Speed Data Report*").

[36] *See, e.g.*, *Yankee Group Consumer Broadband Predictions Report* at 4 & Exh. 1 ("The Yankee Group projects satellite broadband will reach 300,000 households in the United States by the end of this year and grow to 4.5 million households by the end of 2005." According to predictions by the Yankee Group for the entire broadband market, this will translate into a market share jump from 2.81% at the end of 2001, to 14.48% at the end of 2005.); *see also Broadband 2001* at Table 9 (estimates show satellite market share expanding from 1 percent in 2000 to 10 percent in 2005). *See also* Business Communications Company, Inc. Press Release, *Market for Broadband Internet Access Continue to Soar* (Nov. 1, 2001) ("Two-way satellite broadband Internet access will be the fastest growing single-access technology, with expenditures growing at an AAGR of 36.6% from $ 1.14 billion (or 12.8% of all broadband related expenditures) to $ 5.42 billion, or 20.5% of expenditures. This rapid growth will reflect the introduction and aggressive marketing of several high-profile satellite Internet services to the residential market during the 2002 to 2004 period, as well as the continued expansion of the installed base of satellite dishes in U.S. households for satellite TV broadcast services.").

[37] *See, e.g.*, AT&T Reply Comments at 80, *Applications for Consent to the Transfer of Control of Licenses from MediaOne Group, Inc., Transferor, to AT&T Corp., Transferee*, CS Docket No. 99-251 (FCC filed Sept. 17, 1999) (DSL services are "the most obvious competitors of broadband cable modem services."); Time Warner Entertainment Company, L.P., Form 10-K405 (SEC filed Apr. 2, 2001) ("Time Warner Cable's systems face competition in its cable modem services from a variety of companies that service customers with various other forms of 'on-line' services, including DSL high-speed Internet access services . . . ").

[38] *See, e.g.*, BellSouth Corp., Form 10-K (SEC filed Mar. 2, 2001) ("Technological developments have made it feasible for cable television networks to carry data and voice communications, and, as such, we face increased competition within our region from cable television ventures.").

competitor to cable modem service.[39] Satellite and fixed wireless providers have likewise recognized cable modem and DSL as their main competitors.[40]

Finally, each of these services – with the possible exception of satellite – is priced at similar levels. The FCC has acknowledged that "cable Internet access providers and DSL operators offer services at around the same price."[41] *See* Table 2.[42] Fixed wireless operators offer consumer broadband services within this range as well. *See id.*[43]

Two-way satellite services – which have been commercially available for approximately one year – are currently priced somewhat higher than cable modem, DSL, or fixed wireless. *See* Table 2. But broadband satellite prices have already begun to decline,[44] and are expected to decline further in the near future.[45] Moreover, the equipment needed for broadband satellite may

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[39] *See, e.g.*, S. Schiesel, *Cable Giants Block Rival Ads in Battle for Internet Customers*, N.Y. Times at C1 (June 8, 2001) (quoting Charter Communications: "this is the most direct competition to one of [our] core products and it would be cutting off [our] nose to spite [our] face to run it."; quoting Cox: "[w]e routinely have taken the position of not taking advertising from our direct competitors."); K. Srinivasan, *Levin Brushes Off Complaints About DSL Ads*, AP (June 13, 2001) (Steve Lang, AT&T Broadband: "We are not put on this planet to make life for our competitors easy.").

[40] *See, e.g.*, StarBand Communications Inc., Form S-1 (SEC filed Oct. 11, 2000) ("We compete with providers of various high-speed communications technologies for local access connections, such as cable modem and DSL"); Sprint and MCI WorldCom Reply to Comments and Petitions to Deny Application for Consent to Transfer Control at 77-78, *Applications of Sprint Corp., Transferor, and MCI WorldCom, Inc., Transferee, for Consent to Transfer Control of Corporations Holding Commission Licenses and Authorizations Pursuant to Sections 214 and 310(d) of the Communications Act and Parts 1, 21, 24, 25, 63, 73, 78, 90, and 101*, CC Docket No. 99-333 (FCC filed Mar. 20, 2000) ("[T]he speed of broadband access deployment is not keeping pace with demand. In fact, '[b]roadband [access] is being held back by supply.'. . . Notably, the Commission has recognized that fixed wireless, including MMDS, may offer a 'third pipe' solution to the expense and delays of constructing last mile broadband capabilities.").

[41] *Seventh Video Competition Report* ¶ 53.

[42] *See, e.g.*, *Broadband 2001* at 21 & Table 3 ("For the past 12-18 months, price points for high-speed access have largely remained between $40 and $50 per month for residential-grade service, with heavy use of promotional offers such as free installation").

[43] *See, e.g.*, E. Tahmincioglu, *For High-Speed Access to the Web, a Dish-to-Dish Route*, N.Y. Times (Oct. 11, 2001) ("The fixed-wireless connection…costs $40 to $60 a month, depending on the provider. Installation and equipment can total around $300 but some companies waive the fees.").

[44] *See, e.g.*, G. Keizer, *The Broadband Breakdown*, CNET News (Oct. 2, 2001), http://www.cnet.com/internet/0-3762-8-7287680-1.html (EarthLink, which resells DirecPC two-way service, recently ran a special promotion offering $300 off equipment and installation).

[45] Y. Noguchi, *Slow to Take Off; Internet Service Via Satellite Remains an Expensive Choice*, Wash. Post at E1 (Aug. 8, 2001) ("[T]he cost difference will diminish as the price of equipment drops and satellite companies start transmitting on a more efficient frequency, which will further reduce transmission and equipment costs."); S. Williams, *Aiming High*, Newsday (Apr. 4, 2001) (John DiDio, Pegasus Express: "The market will force all of us to be competitive . . . I expect prices and monthly fees will drop as we get going."); M. Hernon, *Broadlogic Speaks Out On Satellite Delivered Broadband*, Broadband Networking News (Jan. 2, 2001) (Toby Farrand, president and CEO, Broadlogic Networking Technologies: "With satellite, the cost is consistent with services like digital cable or DSL. We are in the learning curve so satellite tends to be 10 to 20 percent more expensive. But over time that will converge. Costs are coming down very rapidly.").

also be used for video service,[46] which provides added value that must be factored into any straight comparison.[47] And some satellite providers have begun offering special discounts to customers that purchase both video and Internet access services.[48]

If the experience of DBS in video markets is any guide, it should take just a short time before DBS begins to gain significant ground on its wireline competitors in the broadband market. DBS was first introduced commercially in 1994 with very high equipment prices (around $700 plus installation).[49] By the end of 1995, the FCC reported that "[p]rices have declined for some DBS receiving equipment,"[50] and in that year "subscribership to DBS services . . . increased rapidly."[51] By 1996, the FCC reported that "the advent of price competition among DBS providers has contributed to the increase in DBS subscribership, with initial equipment costs dropping to as low as $199 plus installation costs."[52] Today, there are more than 17 million DBS subscribers, representing about 18 percent of the multi-channel video market.[53]

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[46] *See, e.g.*, EarthLink, *For the Home: High Speed Internet Access, EarthLink Satellite, Availability and Pricing*, http://www.earthlink.net/home/broadband/satellite/availability/ (single DirecDuo dish enables customer to receive both DirecTV and DirecPC services); StarBand, *Q&A-Dish Service, Dish Network, Authorized Dish Network Dealer*, http://www.starband.com/wheretobuy/dishsplash.htm (single dish enables both DISH Network and Internet access service; customers that subscribe to both services get access fee and some installation fees waived).

[47] While their costs are sometimes waived, or leased to end users on a monthly basis, cable modems typically cost between $150 and $250, while network interface cards costs $50 to $100. *See* Broadband Compass, *How Much Does it Cost to Install Broadband?*, http://www.broadbandcompass.com/search/jsp/learnmore/costs.jsp?partnerID=bbl.

[48] Subscribers opting to purchase both satellite broadband and satellite television through StarBand partner Dish Network receive a discount on monthly Internet service totaling $9.99, as well as a $21.99 discount on monthly television fees for the first year of service. This totals $383.76 in savings for the first year. *See* StarBand, *New Two-Way, Always-On, High-Speed Internet via Satellite*, http://www.starband.com/wheretobuy/dishsplash.htm.

[49] *Implementation of Section 19 of the Cable Television Consumer Protection and Competition Act of 1992; Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, First Report, 9 FCC Rcd 7442, ¶ 65 (1994); *id.* (noting that equipment required to receive DBS service costs $699, and subscribers can either pay $150-200 for professional installation or purchase the installation equipment for $69.95).

[50] *Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming*, Second Annual Report, 11 FCC Rcd 2060, ¶ 9 (1995).

[51] *Id.* ¶ 49.

[52] *Id.* ¶ 38.

[53] *Eighth Video Competition Report* ¶ 18; SkyReport, *National DTH Counts: November 2000 – November 2001*, http://www.skyreport.com/dth_us.htm.

Table 2. Pricing Similarity of Residential Broadband Services		
	Typical Monthly Service Fee**	**Typical Up-Front (Non-Recurring) Charges**
Cable Modem	$35 - $50	Installation: $99 - $200; Modem: $0* - $265
ADSL	$30 - $50	Installation: $0* - $175; Modem: $99 - $200
Satellite (2-way)	$60 - $70	Installation: $200; Dish and Modem: $400 - $649
Fixed Wireless	$35 - $40	Installation: $0* - $299; Dish and Modem: $0* - $299
* Charges are sometimes waived. Rental charges for cable modems are often included in the monthly service fee. ** Includes fees for Internet access.		

C. Local Areas with Mass Market Broadband Suppliers.

In many markets in the U.S. today, only one or two of the four possible broadband alternatives is currently available. According to data filed with the FCC, as of June 2001, there were two or more broadband providers serving actual subscribers in 58 percent of all U.S. zip codes,[54] and three or more providers serving actual subscribers in 41 percent of zip codes.[55]

Cable modem is – by a wide margin – the most widely used broadband alternative. As of year end 2001, there were 7.5 million cable modem subscribers in the U.S., compared to 3.3 million residential DSL subscribers, and approximately 100,000 broadband satellite and fixed wireless subscribers.[56] *See* Figure 1. Cable not only has a large lead over other broadband technologies, but it also continues to add new subscribers at a faster rate.[57] In 2001, cable has

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[54] *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, Third Report, App. C at Table 9, CC Docket No. 98-146, FCC 02-33 (rel. Feb. 6, 2002) ("*Third Advanced Services Report*").

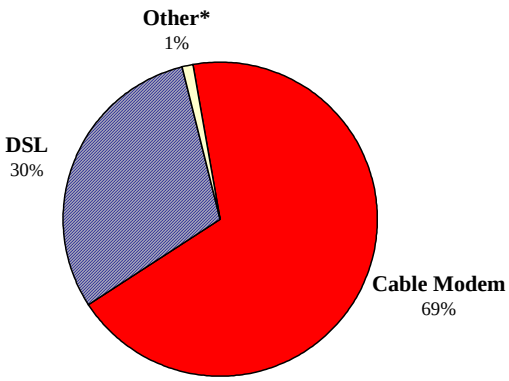
[55] *Id*.

[56] *Morgan Stanley Cable Modem/xDSL Conference Call Report* at Exh. 3 (cable modem); xDSL.com, *TeleChoice 4Q01 DSL Deployment Summary*, http://www.xdsl.com/content/resources/deployment_info.asp (residential DSL); *Salomon Smith Barney Battle for High-Speed Data Report* at Figures 1 & 5 (broadband satellite and fixed wireless). *See also* Consolidated Application for Authority to Transfer Control at 6, 45, *Application of EchoStar Communications Corporation, General Motors Corporation, Hughes Electronics Corporation, Transferors, and EchoStar Communications Corporation, Transferee, For Authority to Transfer Control* (FCC filed Dec. 3, 2001) (estimating total satellite subscribers); J. Morris, *Satellite Internet Providers Facing Road Against Cable, DSL Competitors*, Aerospace Daily at 1 (June 13, 2001) (estimating 44,000 two-way satellite subscribers); Yankee Group, *Fiber-to-the-Curb, Fiber-to-the-Home, Fixed Wireless, and Powerline Communications: Threatening Cable Modem's and DSL's Hegemony?*, Consumer Market Convergence, Vol. 18, No. 13 (Nov. 6, 2001) (estimating roughly 61,000 residential MMDS users in 2001); P. Schoener & A. Sabia, Gartner, Inc., *U.S. Consumer Telecommunications and Online Market, 2001* at Table 7-1 (Nov. 8, 2001) (approximately 100,000 households with fixed wireless Internet access as of 2000).

[57] *See Salomon Smith Barney Battle for High-Speed Data Report* at Figure 1; *Yankee Group Critical Mass Report* at Exhs. 2 & 3. Cable modem also has a higher penetration rate among homes passed than DSL. *See Salomon Smith Barney Battle for High-Speed Data Report* at Figures 9 & 10. *See also* Cable Datacom News, *Cable Modem Market Stats & Projections*, http://cabledatacomnews.com/cmic/cmic16.html (updated May 3, 2000 – 1Q 2000 cable modem subscribers; updated Aug. 16, 2000 – 2Q 2000 cable modem subscribers; updated Nov. 8, 2000 – 3Q 2000 cable modem subscribers; updated Mar. 1, 2001 – 4Q 2000 cable modem subscribers); *Broadband Internet Subscriber Base Tops 9M*, Cable Datacom News (June 1, 2001), http://cabledatacomnews.com/jun01/jun01-1.html

indeed increased its market share of new subscriber additions. *See* Figure 2. Moreover, analysts expect cable to maintain a considerable lead over DSL and other broadband technologies for the foreseeable future.[58] This is due in large part to the fact that cable modem service is expected to be more available than DSL in the future, which give it what analysts term a "natural advantage" in the ability to attract new subscribers.[59]

Figure 1. Market Share of Residential Broadband Subscribers YE 2001



*Satellite and fixed wireless.

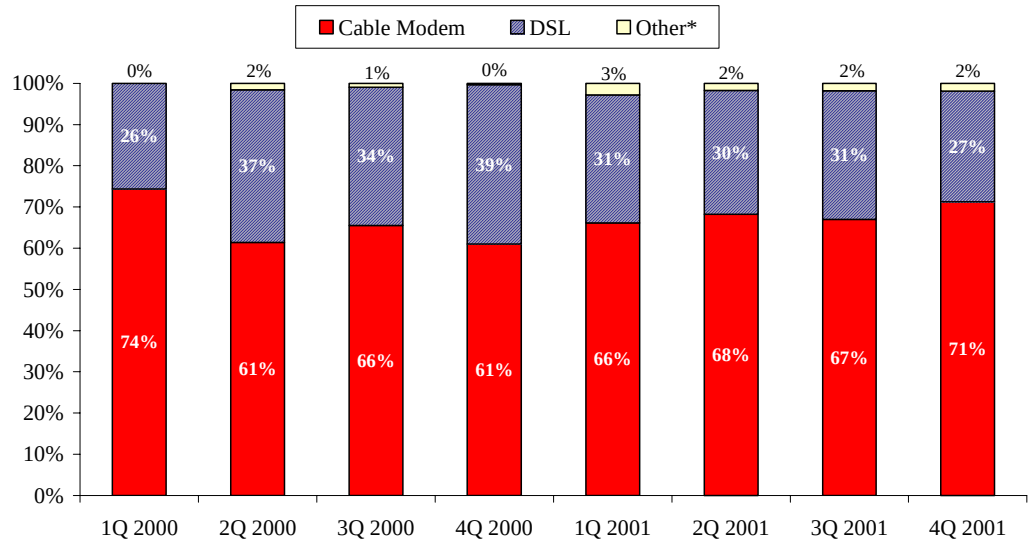
Sources: R.A. Bilotti, *et al.*, Morgan Stanley, Dean Witter, *Cable Modem and xDSL Conference Call* at Exh. 3 (Jan. 18, 2002) (cable modem subscribers as of 4Q 2001); xDSL.com, *TeleChoice 4Q01 DSL Deployment Summary*, http://www.xdsl.com/content/resources/deployment_info.asp (DSL subscribers); Salomon Smith Barney, *The Battle for the High-Speed Data Subscriber: Cable vs. DSL* at Figures 1 & 5 (Aug. 20, 2001) (other technologies).

(1Q 2001 cable modem subscribers); *Residential Broadband Customer Count Tops 10 Million*, Cable Datacom News (Sept. 1, 2001), http://cabledatacomnews.com/sep01/sep01-1.html (2Q 2001 cable modem subscribers); *North American Cable Modem Subscriber Count Tops 8 Million*, Cable Datacom News (Dec. 1, 2001), http://cabledatacomnews.com/dec01/dec01-2.html (3Q 2001 cable modem subscribers); *Morgan Stanley Cable Modem/xDSL Conference Call Report* at Exh. 3 (4Q 2001 cable modem subscribers); xDSL.com, *TeleChoice DSL Deployment Summary*, http://www.xdsl.com/content/resources/deployment_info.asp (residential DSL subscribers).

[58] *See, e.g.*, *Broadband 2001* at Table 9 (estimating that by 2005, cable will have 51 percent of broadband subscribers, while DSL will have 37 percent.); *Yankee Group Consumer Broadband Predictions Report* at Chart 1 (predicting that cable will have 49.7 percent of high-speed users, while DSL will have 33.8 percent); *Salomon Smith Barney Battle for High-Speed Data Report* at 1 (cable will account for 59 percent of subscribers and DSL will account for 34 percent in 2005); M. Pastore, *High Speed Access to Pass Dial-Up in 2005*, Cyberatlas, http://cyberatlas.internet.com/markets/broadband/article/0,1323,10099_567101,00.html (citing Strategis Group Study which finds that, in 2005, 45 percent of high speed subscribers will go with cable and 40 percent will go with DSL.); *TeleChoice Sees Slower But Still Substantial Growth in DSL*, xdsl.com (Aug. 13, 2001), http://www.xdsl.com/content/tcarticles/wp081101.asp.

[59] *See, e.g.*, *JP Morgan Cable Industry Report* at 36 ("Assuming that each platform takes 50% share in markets where both services are available, cable enjoys a more than 2:1 advantage in what each platform's "natural" market share would be, holding all other variables – price, performance, bundling benefits – constant.").

Figure 2. Market Share of New Residential Broadband Subscribers



*Satellite and fixed wireless.

Sources: Salomon Smith Barney, *The Battle for the High-Speed Data Subscriber: Cable vs. DSL* at Figure 1 (Aug. 20, 2001) (3Q and 4Q 2001 est. for other technologies based on 2Q 2001 share); Ind. Anal. Div., FCC, *High-Speed Services for Internet Access: Subscribership as of June 30, 2001* at Tables 1 & 3 (Feb. 2002) (percent of satellite & fixed wireless subscribers that serve mass market customers); Cable Datacom News (Kinetic Strategies estimates for cable modem subscribers); R.A. Bilotti, *et al.* , Morgan Stanley, Dean Witter, *Cable Modem and xDSL Conference Call* at Exh. 3 (Jan. 18, 2002) (cable modem subscribers as of 4Q 2001);.xDSL.com, *TeleChoice DSL Deployment Summary* (TeleChoice estimates for DSL subscribers).

Just as DSL trails cable in actual subscribers, it is considerably behind in terms of availability, and significant investment is required to deploy broadband more broadly.[60] Analysts estimate that cable modem service was available to between 50 and 71 percent of U.S. households as of first quarter 2001,[61] and that it was available to between 66 and 77 percent of U.S. households as of year-end of 2001.[62] By contrast, analysts estimate that DSL was available

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[60] At the end of second quarter 2001, cable modem had a 5 percent penetration rate and DSL had a 2.5 percent penetration rate in the residential market. *See Salomon Smith Barney Battle for High-Speed Data Report* at Figures 9 & 10. Analysts likewise predict that cable modem will be available to a considerably greater number of homes than DSL by 2005. *See, e.g., Yankee Group Critical Mass Report* at 4-5 (cable modem service is expected to be available to 83 percent of households by 2005, while DSL service is expected to be available to 74 percent of households.); *Broadband 2001* at Chart 32 (McKinsey & Co./JP Morgan projects that about 70 percent of households will have both cable modem and DSL service available by 2005).

[61] *See Yankee Group Critical Mass Report* at 4 (while 54 percent of the cable infrastructure had been two-way enabled, cable modem service was available to 50 percent of households because not all households are passed by the cable infrastructure); *JP Morgan Cable Industry Report* at 12, Figures 12 & 36 ("Fully 38% of the nation's households can get high-speed services only from a cable company," while an additional 33 percent can get high-speed services through either cable or DSL).

[62] *See Yankee Group Critical Mass Report* at Exh. 4; *Broadband 2001* at Tables 1 & 6. *See also* NCTA, *Industry Overview; Industry Statistics*, http://www.ncta.com/industry_overview/indStat.cfm?indOverviewID=2 (visited Oct. 8, 2001) (as of November 2001, 70 million households were passed by cable modem service). The cable industry association estimates that, by year-end 2002, approximately 95 million U.S. homes (or nearly 90 percent of homes passed by cable) will have access to cable modem service. *See* NCTA, *Cable & Telecommunications Industry Overview 2001* (2001) (citing Morgan Stanley, Dean Witter, *Broadband Cable Second – Quarter Review* at 9 (Aug. 29, 2001)).

to approximately 34 to 43 percent of all households as of first quarter 2001, and that it was available to approximately 45 percent by the end of 2001.[63]

Analysts further estimate that approximately one-third of all U.S. households currently have access to both cable modem and DSL service.[64] Approximately three-quarters of all homes with access to DSL also have access to cable modem service.[65]

Table 3. Availability of Broadband Services

	2001	2002	2003	2004	2005
Cable Modem					
McKinsey & Co. /JP Morgan	77%	81%	84%	85%	87%
Yankee Group	66%	77%	81%	82%	83%
DSL					
McKinsey & Co./JP Morgan	51%	60%	64%	70%	n/a
Yankee Group	45%	54%	62%	70%	74%
Satellite	50 states, covering over 90% of U.S. households				
Fixed Wireless	3%	n/a	n/a	n/a	41%

Although DSL is an attractive technology with which telephone companies can enter the broadband business, ILECs will need to make significant additional investments in their networks in order to provide broadband over the long term. This will likely involve deploying a great deal of new fiber optics and associated electronics.[66] The FCC has recently stated that "the widespread deployment of broadband infrastructure" will require "the complete or near-complete replacement of copper lines with end-to-end fiber optic transmission facilities."[67] Thus, while

[63] According to the Yankee Group, the percentage of households with DSL available rose from 11 percent in 1999, to 34 percent in 2000, and is projected to rise to 45 percent by year-end 2001. *See Yankee Group Critical Mass Report* at Exh. 4. According to McKinsey & Co./JP Morgan estimates, DSL is the only high-speed service available to 10 percent of households, while an additional 33 percent can get high-speed services through either cable or DSL. *See JP Morgan Cable Industry Report* at Figures 12 & 36.

[64] *JP Morgan Cable Industry Report* at Figures 12 & 36; *Broadband 2001* at Chart 25.

[65] *See, e.g.*, *JP Morgan Cable Industry Report* at Figures 12 & 36 (JP Morgan estimates that as of 1Q 2001, 10 percent of households had access to DSL only, and 33 percent had a choice of DSL or cable; therefore, approximately one-quarter of households with access to DSL did not have access to cable (10/43=23.3)).

[66] *See, e.g.*, I. Burgess, Credit Suisse First Boston, Investext Rpt. No. 2989479, European Telecom Equipment Weekly Update – Industry Report at *4 (Nov. 12, 1999) ("Ultimately the limitations of copper cable ensure that the economic solution is to push fibre deeper and deeper into the network, closer and closer to the user"). *See also* Wall Street Transcript Corp., Investext Rpt. No. 2001619, Roundtable Forum: Semiconductor Equipment – Industry Report at *31 (Mar. 23, 2000) (Bear Stearns analyst Robert Maire: "[W]e're talking about ripping out 75 years' worth of copper wire and circuit-switched equipment and replacing it with high-speed fiber-optic gigabit routers and switches and wireless base stations and wireless infrastructure.").

[67] *Appropriate Framework for Broadband Access to the Internet over Wireline Facilities*, Notice of Proposed Rulemaking, ¶¶ 1, 12, CC Docket No. 02-33, FCC 02-42 (rel. Feb. 15, 2002).

"xDSL may be the prevailing technology of the day for the last mile . . . ongoing advances in technology may someday replace it as fiber moves close to or into the home."[68]

The current regulatory environment greatly reduces the incentive to make these upgrades, however. The 1996 Act requires incumbent local carriers to "unbundle" their network facilities and provide them to competitors at cost-based rates.[69] Although the far-reaching provisions of the Act were intended to apply only to narrowband voice,[70] the Commission has extended them to broadband. For example, ILECs are required to unbundle and provide to competitors the portion of the loop used solely for broadband services.[71] ILECs also must condition voice-grade loops for CLECs so that they can be used for broadband services (even if the incumbent did not plan on conditioning the loop for its own use).[72] Moreover, ILECs must permit competitors to collocate broadband equipment in their central offices,[73] and at remote terminals. Furthermore, if collocation at a remote terminal is not possible, under certain circumstances the ILEC must unbundle their packet switching capabilities.[74]

When Bell companies provide broadband services, they face additional regulations that other broadband competitors do not. For example, they must file tariffs for their broadband services,[75] and they may not own or operate Internet backbone or any interLATA data networks.[76]

Moreover, under the Commission's current policies, any new major upgrades in the network could potentially be subject to the Act's unbundling regime.[77] As a result, on new, risky

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[68] *Id.* ¶ 12.

[69] 47 U.S.C. §§ 251(c)(3); 252(d)(1)(A)(i).

[70] *See, e.g.*, William E. Kennard, Chairman, Federal Communications Commission, *Consumer Choice Through Competition*, remarks at the Nat'l Ass'n of Telecommunications Officers and Advisors 19th Annual Conference, Atlanta, GA (Sept. 17, 1999) ("The debates surrounding the 1996 Act were mainly about competition in the narrowband world for voice telephony. . . . in the years leading up to the passage of the Act in 1996, everyone was debating voice competition.").

[71] *Deployment of Wireline Services Offering Advanced Telecommunications Capability and Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, Third Report and Order in CC Docket No. 98-147, Fourth Report and Order in CC Docket No. 96-98, 14 FCC Rcd 20912, ¶ 13 (1999).

[72] *See Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, Third Report and Order and Fourth Further Notice of Proposed Rulemaking, 15 FCC Rcd 3696, ¶¶ 172-173 (1999) ("*UNE Remand Order*").

[73] *See Deployment of Wireline Services Offering Advanced Telecommunications Capability*, Fourth Report and Order, 16 FCC Rcd 15435, ¶ 16 (2001).

[74] *See UNE Remand Order* ¶ 313.

[75] *See GTE Telephone Operating Cos., GTOC Tariff No. 1, GTOC Transmittal No. 1148*, Memorandum Opinion and Order, 13 FCC Rcd 22466, ¶ 16 (1998).

[76] 47 U.S.C. § 271(a).

[77] *See, e.g., Ameritech Corp., Transferor and SBC Communications, Inc., Transferee, For Consent To Transfer Control of Corporations Holding Commission Licenses and Lines Pursuant to Sections 214 and 310(d) of the Communications Act and Parts 5, 22, 24, 25, 63, 90, 95, and 101 of the Commission's Rules*, Second Memorandum Opinion and Order, 15 FCC Rcd 17521 (2001); *Deployment of Wireline Services Offering Advanced*

investments in facilities and services that turn out to be very popular, incumbents can hope to recover at most their original costs. New, risky investments that fail, by contrast, are charged to the incumbents' shareholders. Incumbents thus lose the incentive to upgrade their networks to provide next-generation broadband service, as innovations must immediately be shared with direct competitors.[78]

D. Under the Current Regulatory Regime, Mass Market Broadband Growth Has Been Slow Despite Significant Demand.

1. Recent Growth Trends.

Broadband subscriber growth is not nearly as rapid as should be expected given the enormous demand for broadband. In the first half of 2001, growth of both cable modem and DSL slowed for the first time in absolute terms. *See* Figure 3.[79] In each of the first two quarters of 2001, there were fewer new cable modem subscribers and DSL subscribers added than in the

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Telecommunications Capability and Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, Third Report and Order on Reconsideration in CC Docket No. 98-147; Fourth Report and Order on Reconsideration in CC Docket No. 96-98; Third Further Notice of Proposed Rulemaking in CC Docket No. 98-147; Sixth Further Notice of Proposed Rulemaking in CC Docket No. 96-98, 16 FCC Rcd 2101, ¶ 59 (2001).

[78] *See* C. Michael Armstrong, Chairman and CEO, AT&T, *Telecom and Cable TV: Shared Prospects for the Communications Future*, remarks before the Washington Metropolitan Cable Club, Washington, D.C. (Nov. 2, 1998), http://www.att.com/speeches/item/0,1363,948,00.html ("It's not fair. It's not right," declares C. Michael Armstrong, AT&T's CEO. "Worse, it would inhibit industry growth and competition. No company will invest billions of dollars to become a facilities-based broadband services provider if competitors who have not invested a penny of capital nor taken an ounce of risk can come along and get a free ride on the investments and risks of others."); *Last Mile Is the Hardest*, Consumers' Research Magazine (Aug. 1, 2001) (quoting economist Tom Hazlett: "Neither local phone nor cable companies will make the enormous capital investment necessary to expand broadband, he argues, if 'open access' rules require them to share the resulting infrastructure with their competitors at below-market rates."); *MCI Restarts Marketing Local Residential Service in N.Y.*, Comm. Daily (Feb. 4, 1999) (quoting James Cicconi, executive vice president and general counsel, AT&T: "[T]he last thing that government should do . . . is create uncertainty that would have a chilling effect on, and perhaps even retard, these investments."); A. Wilson, *Harmonizing Regulation by Promoting Facilities-Based Competition*, 8 Geo. Mason L. Rev. 729 (Summer 2000) ("Regulatory uncertainty casts a pall over capital markets and dries up critical financial support. Communications policymakers must therefore create and sustain a stable regulatory environment if they want to nurture the development of facilities-based competition."); T. Jorden, J.G. Sidak, and D. Teece, *Innovation, Investment, and Unbundling*, 17 Yale J. on Reg. 8 (2000) ("It makes no economic sense for the ILEC to invest in technologies that lower its own marginal costs, so long as competitors can achieve the identical cost savings by regulatory fiat."); *AT&T v. Iowa Utils. Bd.*, 525 U.S. 366, 429 (1999) (Breyer, J., concurring in part and dissenting in part) ("Increased sharing by itself does not automatically mean increased competition. It is in the *un*shared, not in the shared, portions of the enterprise that meaningful competition would likely emerge. Rules that force firms to share *every* resource or element of a business would create, not competition, but pervasive regulation, for the regulators, not the marketplace, would set the relevant terms."); 3A Phillip Areeda & Herbert Hovenkamp, *Antitrust Law* ¶ 771(b), at 175 (1996) (When a company is to "provide [a] facility and regulat[es] the price to competitive levels, then the [prospective entrant's] incentive to build an alternative facility is destroyed altogether.").

[79] The purchase rate of cable modem equipment has also declined recently. *See* G. Tally, *DSL Growth Slows, Cable Modem Market Declines*, ISPworld (Aug. 16, 2001), http://www.ispworld.com/bs/BS_081601b.htm ("According to the Dell'Oro Group, which released its report [in August 2001], the overall cable modem market declined 17 percent from quarter to quarter . . . This represents a 36 percent yearly decline when compared to 2000.").

previous quarter.[80] The total number of subscribers added by satellite and fixed wireless technologies fell by 50 percent from the first quarter to the second quarter of 2001 (from 40,000 to 20,000 new quarterly additions).[81] That slowdown in absolute terms was particularly striking given that broadband is still in a very early stage of development. The Commission has previously used 1996 as the starting point of residential broadband deployment in the U.S.,[82] which makes broadband about five years old. In the wireless industry, it took more than nine years before there was a six-month stretch in which subscriber additions declined in absolute terms from a previous period.[83] With DBS, it took more than seven years before subscriber additions for a year declined in absolute terms from a previous period.[84]

In the third quarter of 2001, there were about the same number of new cable modem and DSL subscribers added as in the previous quarter – still considerably fewer, however, than in the fourth quarter of 2000. *See* Figure 3. Satellite and fixed wireless also experienced slow growth in the third quarter.[85] In the fourth quarter of 2001, while new cable modem subscribers grew considerably, new DSL subscribers still remained below the growth achieved in the same quarter of 2000.

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[80] During the first two quarters of 2001, there were an average of less than 1.2 million new cable modem and residential DSL subscribers combined, compared with nearly 1.5 million in the fourth quarter of 2000. *See* Cable Datacom News and TeleChoice sources cited *infra* fn.57. And second quarter growth this year was considerably slower than first quarter growth (by 10 percent for cable, and 15 percent for DSL). *Id.*

[81] *See Salomon Smith Barney Battle for High-Speed Data Report* at Figure 1 (market share of broadband subscribers added). The percent of subscribers added by "other" technologies were compared to subscriber data reported in *Broadband Internet Subscriber Base Tops 9M*, Cable Datacom News (June 1, 2001), http://cabledatacomnews.com/jun01/jun01-1.html and *Residential Broadband Customer Count Tops 10 Million*, Cable Datacom News (Sept. 1, 2001), http://cabledatacomnews.com/sep01/sep01-1.html; *North American Cable Modem Subscriber Count Tops 8 Million*, Cable Datacom News (Dec. 1, 2001), http://cabledatacomnews.com/dec01/dec01-2.html (3Q 2001 cable modem subscribers).

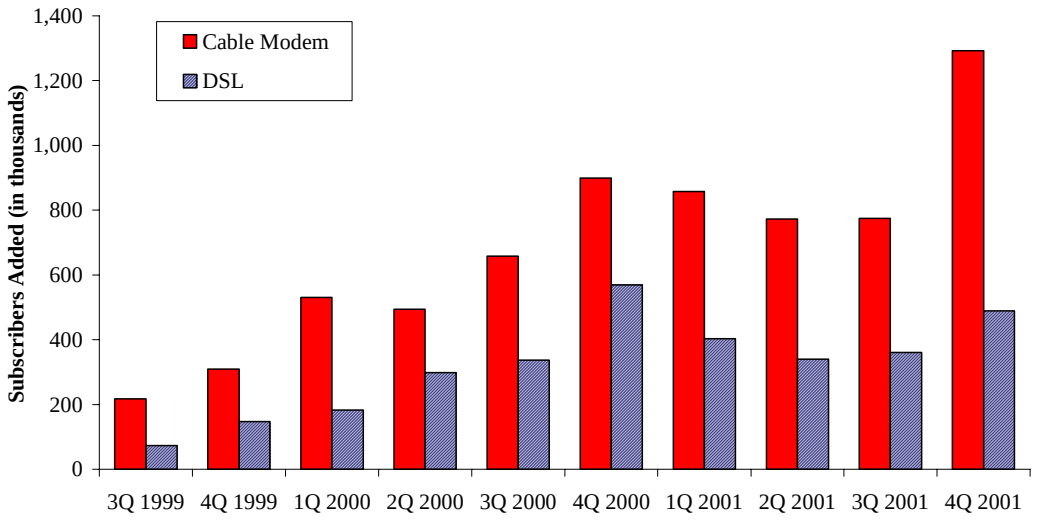
[82] *See Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, Report, 14 FCC Rcd 2398, ¶ 32 (1999) ("*First Advanced Services Report*") (stating in February 1999 that "[f]or broadband . . . we have just completed the second calendar year of commercial offering").

[83] Wireless subscriber additions grew steadily over the previous period until the first half of 1993, when wireless providers added 2.03 million net subscribers, compared to 2.14 million net subscribers in the second half of 1992. CTIA, *CTIA's Semi-Annual Wireless Industry Survey Results*, http://www.wow-com.com/industry/stats/articles.cfm?ID=239.

[84] DBS subscribership grew steadily over the previous period until 2001, when DBS providers added 2.8 million net subscribers, compared to the 3.3 million net subscribers added in 2000. Satellite Broadcasting & Communications Ass'n, *Facts & Figures*, http://www.sbca.com/mediaguide/factsfigures.htm (citing SkyResearch).

[85] *See* R. Konrad, *"Bandwidth Hogs" Not at Home at AT&T*, CNET News.com (Dec. 5, 2001), http://news.cnet.com/news/0-1004-200-8081284.html?tag=lh (a survey by market research firm ARS found that "broadband subscriber growth rates have decreased every quarter over the past two years. In 2000, growth rates were at least 30 percent per quarter – more than double the 2001 quarterly growth rates.").

Figure 3. Residential Broadband Subscriber Growth



Sources: Cable Datacom News (Kinetic Strategies estimates for cable modem subscribers, 3Q 1999-3Q 2001); R.A. Bilotti *et al.* , Morgan Stanley, Dean Witter, *Cable Modem and xDSL Conference Call* at Exhibit 3 (Jan. 18, 2002) (cable modem subscribers as of 4Q 2001); xDSL.com, *TeleChoice DSL Deployment Summary* (TeleChoice estimates for DSL subscribers).

2. There Is Significant Demand for Mass Market Broadband.

As noted above, using the starting point established by the FCC, broadband is now five years old. In that time, broadband has grown to more than 11 million residential subscribers, which represents approximately 10.5 percent of U.S. households.[86] By comparison, approximately 42 to 48 percent of all households currently have narrowband Internet access service;[87] 68 percent have cable service (plus another 12 percent have DBS);[88] and at least 61 percent have a wireless phone.[89]

Just as there is very high demand for broadband among residential consumers, "[d]emand for high-speed Internet access among small and medium enterprises is substantial."[90] Today there are about 1 million DSL lines provided to business customers,[91] and most CLECs that

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[86] xDSL.com, *TeleChoice 4Q01 DSL Deployment Summary*, http://www.xdsl.com/content/resources/deployment_info.asp; *Morgan Stanley Cable Modem/xDSL Conference Call Report* at Exh. 3.

[87] *Broadband 2001* at Table 4; P. Schoener & A. Sabia, Gartner, Inc., *U.S. Consumer Telecommunications and Online Market, 2001* at Table 7-1 (Nov. 8, 2001).

[88] NCTA, *Industry Statistics*, http://www.ncta.com/industry_overview/indStat.cfm?indOverviewID=2 (basic cable households as of November 2001); *Eighth Video Competition Report*, App. C at Table C-1; *Broadband 2001* at Exh. 21.

[89] Gartner Press Release, *Gartner Dataquest Survey Shows U.S. Households Disconnecting Extra Phone Line for Other Telecom Modalities* (Sept. 19, 2001).

[90] *Broadband 2001* at 32.

[91] xDSL.com, *TeleChoice 4Q2001 DSL Deployment Summary*, http://www.xdsl.com/content/resources/deployment_info.asp

provide DSL service focus on the small business market.[92] Nonetheless, "[t]he menu of broadband services aimed at SMEs is much more extensive than that available to residential customers."[93] Analysts estimate that "[b]roadband penetration among SMEs is currently 11% of online firms," and that "[b]y 2005 . . . almost 50% of all SMEs will have broadband access principally via xDSL, HFC, or other new platforms."[94]

By most accounts, the demand for broadband is greater than current levels of penetration or recent growth trends suggest. Indeed, in areas where broadband services are widely available, penetration rates are much higher than the national average. For example, according to a study of broadband demand by McKinsey & Company and JP Morgan, broadband penetration in areas where broadband service is "pervasively available" – that is, where it has been available for two to three years – is at least four times higher than the national average, and stands at between 20 and 30 percent of households within those areas.[95] Likewise, both cable modem and DSL providers routinely report penetration rates well above the national average in individual areas where such services are available.[96]

Moreover, demand for data traffic as a whole is growing by approximately 30 to 50 percent per year,[97] which indicates that consumer demand for bandwidth is rapidly increasing. This is further demonstrated by the types of Internet connections consumers are using. From December 1999 to July 2001, the percentage of Internet users connecting at 33.6 kbps or slower has shrunk from 51 percent to 19 percent, while the number connecting at 56 kbps has increased from 42 percent to 63 percent.[98] To meet this demand, the speed of Internet backbones has

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[92] For example, about 60 percent of CLEC DSL lines are provided to business customers. *See id.*; *see also* Aware Inc., *DSL Market*, http://www.aware.com/company/overview/dsl.htm ("ILECs have chosen to focus on Asymmetric DSL (ADSL) service to residential customers, whereas CLECs have chosen to focus on symmetric DSL service to small and medium-sized businesses.").

[93] *Broadband 2001* at 32.

[94] *Id.* at 32-33.

[95] *See id.* at Chart 10.

[96] *See, e.g.*, P. Fusco, *Road Runner Surpasses 250,000 Subscribers*, ISP News (Apr. 6, 1999), http://www.internetnews.com/isp-news/article/0,,8_93021,00.html (Road Runner has penetration rate of 14.55 percent in Portland, Maine); K. Zia, Deutsche Banc Alex. Brown, Investext Rpt. No. 8090375, Cox Communications – Company Report at *6 (Apr. 16, 2001) (Cox has reached 20 percent data penetration in Orange County, its earliest market); N.A. Gupta, *et al.*, Salomon Smith Barney, Investext Rpt. No. 8128752, Cablevision Systems Corp. – Company Report at *4 (Aug. 10, 2001) ("Although both Long Island and Connecticut have [cable modem] penetration rates of 22% and 19% respectively (double in penetration from a year ago), it is worth noting that in several nodes penetration has already surpassed 30% of marketed homes. . . . after 18 months of introducing high-speed data, Cablevision has achieved an impressive 18% penetration in Monmouth County, New Jersey.").

[97] *See, e.g.*, J. Linnehan, Thomas Weisel Partners, LLC, Investext Rpt No. 2295458, Company Report – Level 3 Communications, at * 3 (Sept. 15, 2000) ("Data traffic has surpassed voice traffic at a three to two ratio."); S. Wadhwani, Dain Rauscher Wessels, Investext Rpt No. 2150061, Company Report – Avanex Corp., at * 3 (May 3, 2000) ("While voice traffic is growing at only 3%-5% annually, data traffic is estimated to be growing upward of 30%-50% annually.").

[98] *See* M. Pastore, *Residential High-Speed Access Takes Big Step in 2000*, Cyberatlas (Feb. 8, 2001), http://cyberatlas.internet.com/markets/broadband/article/0,,10099_583711,00.html; M. Pastore, *Move to Broadband*

increased from DS-3 (45 Mbps) in 1996 to between OC-48 (2.5 Gbps) and OC-192 (10 Gbps) in 2001.[99] And capacity on trans-Atlantic and trans-Pacific cables has increased as well: for example, the TAT-11 fiber-optic cable, laid in 1993, has a capacity of less than 3.9 Gbps, while the TAT-14, laid in 2001, has a total capacity of at least 98.2 Gbps; similarly, the TPC-4, laid in 1992, has a total capacity of 1.0 Gbps, while the China-U.S. CN, laid in 2000, has a total capacity of 61.9 Gbps.[100]

Although approximately 88 percent of U.S households with a PC still use narrowband dial-up connections to access the Internet, mounting evidence suggests that consumers increasingly find such connections inadequate.[101] Some of the most popular existing uses of the Internet involve downloading very large files – such as video clips, full-length movies, photos, and music – which is prohibitively time-consuming on a narrowband connection. *See* Table 4.[102] Broadband also makes possible many socially valuable activities, such as telecommuting,[103] distance learning,[104] and telemedicine.[105] Consumer surveys indicate that consumers with

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Changes How the Web is Surfed, Internet.com (Aug. 22, 2001), http://siliconvalley.internet.com/news/article/0,2198,3531_870841,00.html.

[99] *Compare, e.g.*, profiles of AT&T, Genuity, Sprint, and MCI WorldCom in *Boardwatch Magazine's Directory of Internet Service Providers* (July/Aug. 1997) *with Boardwatch Magazine's Directory of Internet Service Providers* (13th ed. Spring 2001).

[100] *See* L. Blake & J. Lande, Ind. Anal. Div., FCC, *Trends in the International Telecommunications Industry*, at Table 5 (Apr. 2001); *Fast Breaks Newsfront: August 13, 2001*, Inter@ctive Week (Aug. 13, 2001), http://www.interactiveweek.com/article/0,3658,s%253D1825%2526a%253D12061,00.asp.

[101] A consumer survey by McKinsey and Co. and JP Morgan found that "latent demand for broadband is considerable." *Broadband 2001* at 20. A similar survey conducted by the Yankee Group found that "the demand for broadband remains strong." M. Davis, Yankee Group, *2001 DSL Subscriber Forecast* at 5, E-Networks and Broadband Access (July 2001). *See also* P. Schoener & A. Sabia, Gartner, Inc., *U.S. Consumer Telecommunications and Online Market, 2001* at Table 7-1 (Nov. 8, 2001).

[102] J. Yaukey, *Movies on Demand Are Coming to a PC Near You*, Gannett News Service (Sept. 24, 2001) ("Downloading a full-length feature over a fast broadband connection at 1 megabit per second (Mbps) takes about 30 minutes. Over a slow broadband connection of 128 kilobits per second (Kbps), it could take hours. Over a dial-up connection it could take the better part of a day."); M. Bartlett, *Pirated Movies Abound on the Web*, Newsbytes (Aug. 1, 2001) (Derek Broes, CEO of Vidius: "there are 1 million movies available per day worldwide, with about 600,000 downloaded per day."); *Napster Eclipsed by Newcomers*, Wired News (Sept. 6, 2001), http://www.wired.com/news/business/0,1367,46596,00.html ("Four new file-sharing systems – FastTrack, Audiogalaxy, iMesh and Gnutella – were used to download 3.05 billion files during August, according to research firm Webnoize. . . . At the beginning of this year when it was at the height of its popularity, Napster users traded nearly 3 billion files.").

[103] *See, e.g.*, P. Thibodeau, *Broadband Seen as Cure for Economic Ills at Aspen Summit*, Computer World (Aug. 27, 2001), http://www.computerworld.com/itresources/rcstory/0,4167,STO63335_KEY68,00.html ("Widespread availability of broadband clearly could have an impact on the way corporations operate. For example, telecommuting work that requires the online transfer of large files, such as the image files used by insurance underwriters, would be more practicable.").

[104] *See, e.g.*, Hearing of the House Energy and Commerce Committee, Federal News Service, Inc. (April 25, 2001) (quoting Rep. Steve Buyer (R-Ind.): "Broadband, both fixed and wireless, has the ability to transform the way teachers teach and the way our students learn."); *Cost and Convenience Drive Consumer Interest in Online Distance Learning*, PR Newswire (Sept. 25, 2001) ("It's clear distance learning can have a major impact on the rollout of broadband," said Tim Herbert, eBrain Director of Research).

broadband connections use the Internet much more often than consumers with narrowband connections.[106] Such surveys likewise confirm that consumers that use broadband are using high-bandwidth applications far more often than narrowband consumers.[107]

Table 4. Comparison of Broadband and Dial-up Download Times

Media	File Size	Narrowband (Dial-up)		Broadband	
		28.8k	56k	560k	1.544M
Digital photograph[1]	900 KB	4 minutes	2 minutes	13 seconds	5 seconds
A Tale of Two Cities[2]	1.6 MB	7 minutes	4 minutes	23 seconds	8 seconds
Five minute song[3]	4.6 MB	21 minutes	11 minutes	66 seconds	24 seconds
High-resolution, full-screen 20-second video clip[4]	25 MB	2 hours	1 hour	6 minutes	2 minutes
Entire audio CD[5]	650 MB	50 hours	26 hours	3 hours	1 hour
Titanic the movie[6]	1.13 GB	3.6 days	2 days	4.5 hours	98 minutes

[1]Assuming an uncompressed digital photograph. [2]*A Tale of Two Cities* as an e-book. [3]Assuming use of MPEG-3 format. [4]Assuming a 20-second video clip in MPEG-2 format. [5]Assuming a 650 MB recordable CD. [6]Assuming a 194-minute video compressed with MPEG4 technology. *Sources: See* Appendix.

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[105] *See, e.g.*, R. MacMillan, *Sen. Brownback Unveils Two Broadband Bills – Update*, Post-Newsweek Business Information, Inc. (June 29, 2001) ("'Broadband will enable the next generation of Internet services and products such as telemedicine, distance learning, and multi-media,' said ITI President Rhett Dawson. 'These activities will skyrocket once broadband is able to connect more people to the high-speed Internet.'").

[106] *See, e.g.*, *Broadband 2001* at Charts 16 and 17 (as broadband users, survey participants spent on average 21.4 hours per month online, as compared to 15.9 hours with a narrowband connection. These same users also spent more time per session (32 minutes vs. 21 minutes), spent more days online (18 vs. 17) and viewed more pages per month (1,828 vs. 1,561)); Jupiter Media Metrix Press Release, *Over 40 Percent of US Online Households to Connect Via Broadband by 2006, Reports Jupiter Media Metrix* (Oct. 17, 2001) ("Broadband consumers continue to use their connections more intensively than narrowband consumers do…").

[107] According to a Broadband Watch study, customers are using broadband to engage in online activities such as shopping online (95 percent), e-mailing photos (76 percent), downloading streaming video (64 percent), downloading MP3s (61 percent), telecommuting (60 percent), creating Web pages (49 percent) and playing games (47 percent). Respondents also reported that with DSL, they are much more likely to engage in these higher-bandwidth activities: downloading MP3s: 61 percent with DSL vs. 35 percent with dial-up; downloading video: 64 percent with DSL vs. 36 percent with dial-up; and e-mailing photos: 76 percent with DSL vs. 62 percent with dial-up. *See Survey Says: DSL Users "Addicted" to Broadband*, Business Wire (Apr. 3, 2001). *See also* Jupiter Media Metrix Press Release, *Over 40 Percent of US Online Households to Connect Via Broadband by 2006, Reports Jupiter Media Metrix* (Oct. 17, 2001) ("Broadband users are more likely than dial-up users are to download music (46 percent of broadband users, 26 percent of dial-up users), listen to music (48 percent and 30 percent, respectively) and watch video (36 percent and 18 percent, respectively). . . . [M]ore broadband consumers conduct personal banking (48 percent and 30 percent, respectively) and stock-related activities online (35 percent and 23 percent, respectively) than dial-up consumers do.").

Although consumer demand for broadband already is considerable, it is likely to increase significantly in the future as new "killer" broadband applications emerge.[108] In the *First Advanced Services Report*, the FCC found that "broadband facilities" are an "input product" for which a "virtuous cycle" – whereby "successive generations . . . provide more performance for the same amount of money" – can develop.[109] With products of this sort, "[t]he greater performance enables current applications to perform better and fuels more demand for them, *and demand for new applications that were not feasible before*."[110] In particular, "[a]s the cycle gains momentum and cost decreases and performance increases . . . companies will provide new applications and services for broadband consumers. As a result, more consumers will demand broadband, and the virtuous cycle will accelerate."[111] As the Commission has explained, "[w]e have seen such a virtuous cycle in bandwidth in the SONET market for optical networking, in the local area network market for desktop data communications, and in the modem market for consumers."[112] So-called "killer applications" are indeed responsible for rapid growth in various other technologies and services. For example, PC sales were driven by the advent of computer programs such as Visicalc and Lotus 1-2-3.[113] Narrowband Internet access was driven by the advent of the World Wide Web and e-mail.[114]

Although it is difficult to predict with certainty what the next so-called "killer application" for broadband will be, there are many known possibilities. The FCC has stated that new broadband applications could include "real-time video" and "the ability to download feature-length movies in a matter of minutes."[115] Intel has stated that "[v]ideo on demand is likely to be highly valued by consumers. File sharing also promises to transform a gamut of activities ranging from the way in which workers collaborate to the exchange of family photos

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[108] Broadband Watch also found that there is growing anticipation for emerging high-speed Internet access products and services. In fact, more than two-thirds of the respondents expressed interest in future applications and content such as distance learning (71 percent), video-on-demand (70 percent), video conferencing (69 percent) and home networking (66 percent). *Survey Says: DSL Users "Addicted" to Broadband*, Business Wire (Apr. 3, 2001). *See also* C. Stern, *High-Speed Internet Market Slows*, Washtech.com (Aug. 28, 2001), http://www.washtech.com/news/telecom/12155-1.html ("high-speed, always-on connection is supposed to open up the doors to a whole new era of Web-based music, video and other services.")

[109] *First Advanced Services Report* ¶ 95.

[110] *Id.*

[111] *Id.* ¶ 96.

[112] *Id.* ¶ 95.

[113] *See, e.g.*, M. Wylie, *The Man Who Made PCs Useful*, CNET News (Oct. 13, 1997), http://news.cnet.com/news/0-1014-201-1473657-0.html ("When VisiCalc shipped in 1978 . . . VisiCalc inspired mass purchases of the Apple II, kick-starting the personal computer revolution"); S. Cowley, *Break Out the Candles, IBM PC Turns 20*, IDC.net (Aug. 9, 2001), http://www.idg.net/english/crd_pc_685684.html (quoting Joe Tartaglia, president and co-founder of New York-based computer services and software design shop High Caliber Systems: "The PC was a nonentity until about 1983 or '84. Until Lotus 1-2-3 came out, the PC did nothing.").

[114] *See, e.g.*, U.S. Internet Council, *State of the Internet Report 1999*, http://www.usic.org/papers/stateoftheinternet99.htm ("Once the Internet became available to households with the advent of the World Wide Web, it took less than seven years to reach the 30 percent penetration level.").

[115] *First Advanced Services Report* ¶ 3.

and videos."[116] Intel also expects broadband to have a "profound," effect on "peer-to-peer computing,"[117] which includes Napster-like services that engaged in the "sharing of computer resources and services by direct exchange between systems."[118] The demand for broadband could also be fueled by the advent of "pervasive computing" where items such as household appliances become Internet-enabled.[119] Other observers have cited as potential broadband drivers the return of a Napster-like music-sharing service,[120] online gaming,[121] video instant messaging,[122] computer virus protection and firewall services,[123] and digital photography.[124]

Numerous efforts to create new broadband applications are indeed underway.[125] Seven different movie studios have recently announced joint ventures to sell feature films over the

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[116] Comments of Intel Corporation at 5, *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, CC Docket No. 98-146 (FCC filed Sept. 24, 2001).

[117] *Id.*

[118] Peer-to-Peer Working Group, *What Is Peer-to-Peer?*, http://www.peer-to-peerwg.org/whatis/ ("In a peer-to-peer architecture, computers that have traditionally been used solely as clients communicate directly among themselves and can act as both clients and servers, assuming whatever role is most efficient for the network.").

[119] V. Cerf, *Cerf's Up: Internet History*, http://www.worldcom.com/generation_d/cerfs_up/internet_history/q_and_a.phtml#question_4. The National Institute of Standards and Technology (NIST) held a conference at the beginning of May 2001 on pervasive computing. The conference agenda was downloaded from: http://www.nist.gov/pc2001/agenda.html. An Internet search using the Google search engine yields 28,000 hits for the term "pervasive computing" and 26,000 hits for "ubiquitous computing." *See* Google, *Advanced Search*, http://www.google.com (as of Dec. 13, 2001).

[120] *See, e.g.*, C. Tristram, *Broadband's Coming Attractions*, Technology Review (June 2001), http://www.technologyreview.com/magazine/jun01/tristram.asp ("The single most important reason people have signed up for broadband is they want to download music files faster.").

[121] IDC Press Release, *Game On! IDC Survey Reveals 60% of Gaming Households Show High Interest in Online Gaming* (Aug. 21, 2001) (an IDC survey found "[t]he availability and adoption of broadband in U.S. households is definitely influencing online gaming," and that "[b]roadband households have much higher interest levels in online gaming activities and are prime targets for an array of gaming options and services." "Although only 6.5% of videogame households have broadband access, that penetration will continue to grow, which bodes well for next-generation consoles that are basing online gaming efforts on broadband communication.").

[122] *See* A. Azhar, *Online: Second Sight*, Guardian at 10 (June 14, 2001) ("[Instant messaging] becomes much more valuable with an always-on connection, because you are more likely to use it."); *AOL/Time Warner Order* ¶ 143 ("Even more bandwidth-intensive will be video conferencing via IM, which at least one study group predicts will be a major success in the marketplace. Also, many kinds of streaming video broadband content will likely be delivered via IM to both home and business users in forms such as long video entertainment and business documents in video form.").

[123] *Broadbanders for Data Protection*, TBR Business Briefs, Telco Business Report (May 7, 2001).

[124] J. Yaukey, *Digital Cameras Offer Instant Gratification*, USA Today (May 16, 2000) ("the expansion of broadband Internet service into American homes is making photo transfer fairly quick and easy.").

[125] *See, e.g.*, *AOL/Time Warner Order* ¶ 69 ("other applications, such as video-on-demand, telemedicine, full-featured software applications, and distance learning are available or under development. . . . The existence of high-speed transmission is necessary to spur development of such applications").

Web.[126] Microsoft and CinemaNow have recently created a new application (PatchBay) to simplify the creation of Web-based video-on-demand networks, and CinemaNow has launched a pay-per-view service of feature films in downloadable format.[127] The newest generation of video games (such as Microsoft's Xbox and Sony's PlayStation 3) were shipped with an Ethernet port that enables a high-speed connection through cable modem or DSL, rather than a dial-up modem as with previous generations of game consoles.[128]

These new broadband applications are going to require much greater bandwidth than is available today, even with existing broadband technologies.[129] This will, in turn, require enormous amounts of additional new investment to develop networks capable of supporting these new bandwidth requirements.[130] Manufacturers of computers and other types of hardware that use bandwidth are all but unanimous in their view that – as Intel CEO Craig Barrett puts it, "broadband" only gets exciting "when you get to 5 megabits per second or even 100 mbps."[131] What ranks as "broadband" today "is not sufficient to provide some of the serious content people are interested in."[132]

Massive investment is needed to provide more robust broadband in the last mile. Although DSL is an attractive technology with which telephone companies can enter the broadband business, ILECs will need to make significant additional investments in their networks in order to provide broadband over the long term. This will likely involve deploying great deal of new fiber-optic facilities and associated electronics in the distribution network.[133]

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[126] *See* G. Mariano, *Microsoft, CinemaNow Show VOD Service*, CNET News.com (Sept. 30, 2001), http://news.cnet.com/news/0-1005-200-7340974.html ("Hollywood is launching its Web-based video-on-demand efforts, with two groups of studios backing different plans in the past two months. Walt Disney and News Corp.'s 20th Century Fox teamed up this month, following a deal in August between Metro-Goldwyn-Mayer, Viacom's Paramount Pictures, Sony Pictures Entertainment, Vivendi Universal's Universal Studios and Warner Bros.").

[127] *See id.*

[128] *See* Broadband Left Me at the Alter, *Red Herring* at 45 (Mar 2002).

[129] *See, e.g.*, K. Ladendorf, *Let There Be Light Waves*, Austin American-Statesman (Mar. 26, 2001) (quoting communications consultant Jeff Kagan: "Tomorrow, the Internet is full-motion entertainment – video and streaming audio. It takes enormous amounts of bandwidth – information carrying capacity – to handle the new applications, and yesterday's networks can't handle the load. That's why communications companies are spending a fortune upgrading their networks."); E. Worthman, *Know Thy Bandwidth, Know Thy Frequency*, Satellite Broadband (Jan. 2001) ("The impending need to increase bandwidth, compact the data or increase the efficiency of the infrastructure is becoming the major issue of the 21st century.").

[130] *See, e.g.*, M. Suydam, *Passive Aggressive*, CommVerge at 40 (May 1, 2001) ("[Passive Optical Network] is obviously much better than copper. While DSL is hot today, how long will that last? Eventually, everything will go into fiber.") (quoting Dong Liu, strategic marketing manager for networking and interface products, Agere Systems).

[131] J. Shiver, *Intel CEO Makes Case for Broadband Aid*, L.A. Times (Jan. 28, 2002).

[132] *Id.*

[133] *See, e.g.*, I. Burgess, Credit Suisse First Boston, Investext Rpt. No. 2989479, European Telecom Equipment Weekly Update - Industry Report at *4 (Nov. 12, 1999) ("Ultimately the limitations of copper cable ensure that the economic solution is to push fibre deeper and deeper into the network, closer and closer to the user.").

As the FCC has recently noted, "[t]he logical technological evolution of the network is the complete or near-complete replacement of copper lines with end-to-end fiber optic transmission facilities."[134] One analyst has estimated that "modernizing our wireline access infrastructure will likely cost over $200 billion from start to finish," and that it will need to be done "without a firm grasp of what services will be demanded and at what price they will be purchased."[135]

II. LARGE BUSINESS BROADBAND.

A. Overview of Large Business Broadband Alternatives.

As the Commission has recognized, large business consumers typically use different broadband technologies than residential consumers.[136] The two principal broadband technologies used by large business customers are Frame Relay and Asynchronous Transfer Mode (ATM).[137] One new broadband technology – Gigabit Ethernet – has recently been deployed, and is growing as an alternative to Frame Relay and ATM for very high-bandwidth applications.

Frame Relay. Frame Relay is a "high-speed packet-switching technology used to communicate digital data between, among other things, geographically dispersed local area networks (LANs)."[138] Frame Relay is the most mature – and widespread – of the packet switching services provided to large business customers.[139] Frame Relay service is offered at speeds of as low as 56 kbps, all the way up to 45 Mbps.[140] Most Frame Relay service is provided at high speeds, however. Approximately 47 percent of Frame Relay revenues are from services provided at full DS-1 speeds or above, and an additional 25 percent are from services provided at fractional DS-1 speeds.[141]

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[134] *Appropriate Framework for Broadband Access to the Internet over Wireline Facilities*, Notice of Proposed Rulemaking, ¶ 12, CC Docket No. 02-33, FCC 02-42 (rel. Feb. 15, 2002).

[135] Douglas Ashton, Bear Stearns and Co., prepared witness testimony before the House Energy and Commerce Committee, Washington, DC (Apr. 25, 2001).

[136] *WorldCom/MCI Order* ¶ 26 ("larger business users often demand advanced long distance features (advanced features), such as frame relay, virtual private networks (VPN), and enhanced 800 services (E800 services), that differ from the services generally demanded by mass market consumers.").

[137] *See* R. Kaplan, IDC, *U.S. Packet/Cell-Based Services Market Forecast and Analysis, 2000-2005* at 109 & Figure 2 (2001) ("*IDC Packet Switching Report*") (frame relay and ATM services account for 96.4 percent of the packet-switching market).

[138] *Independent Data Communications Manufacturers Ass'n Petition for Declaratory Ruling That AT&T's InterSpan Frame Relay Service is a Basic Service*, Memorandum Opinion and Order, 10 FCC Rcd 13717, ¶ 6 (1995).

[139] *See IDC Packet Switching Report* at 5 (frame relay "continues to dominate the packet/cell-based services market, accounting for 82.7% of total revenue in 2000.").

[140] This service is offered at speeds as low as 56 kbps. *See IDC Packet Switching Report* at Figure 7.

[141] *IDC Packet Switching Report* at Table 6.

ATM. ATM is "[a] high-speed multiplexing and switching technique that uses fixed size of cells to support several types of traffic such as voice, data and video."[142] Like Frame Relay, ATM is most often used to transmit data between networks of computers, or between computer networks and the Internet. ATM is, however, also used for voice, though voice still represents a small percentage of all ATM revenues.[143] ATM is offered at speeds starting at 1.5 Mbps, all the way up to 622 Mbps.[144] Approximately 66 percent of ATM revenues are derived from services provided at speeds between DS-1 and DS-3.[145]

Gigabit Ethernet. Gigabit Ethernet is a rapidly growing new packet-switching service that substitutes for traditional packet switching services such as ATM and Frame Relay.[146] Revenues for Gigabit Ethernet are still fairly small – most estimates say under $100 million – but are expected to grow to as much as $4 billion by 2005.[147] A recent survey of corporate users found that, although less than one percent of enterprise networks are using Gigabit Ethernet as their primary LAN transport today, nearly half expect to deploy Gigabit Ethernet within two years.[148] Gigabit Ethernet is typically offered today at speeds of 1 Gbps.[149]

B. Competition for Large Business Broadband Is Widespread.

Just as there are multiple competitive providers of residential broadband services, the same is true for broadband services to large business customers.[150] And as is the case with the

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[142] D. Lathen, Cable Services Bureau, FCC, *Broadband Today: A Staff Report to William E. Kennard, Chairman, Federal Communications Commission, on Industry Monitoring Sessions Convened by Cable Services Bureau* (Oct. 1999).

[143] For example, analysts have estimated that, in 2000, voice-over-packet revenues were between $600 million and $1.4 billion in all of North America, whereas estimates for the packet switching market as a whole range from $7 billion to $12 billion in the U.S. alone. *See* Frost and Sullivan Press Release, *Voice and Data Convergence Goes Mainstream, VoIP Becomes Technology of The Future* (Aug. 6, 2001) (North American VoIP Services Markets wholesale revenues topped $314 million in 2000 and retail traffic accounted for $273 million in 2000); *Staying Ahead Of The Pack Usa Datanet To Soon Offer New Services Series: Progress 2001*, Syracuse Herald American at AA12 (Feb. 4, 2001) (Probe Research of New Jersey estimates global revenue from voice-over-packet telephony at $720 million in 2000); R. Rosenberg, *IP Telephony Vs. Circuit-Switching*, CED Buyer's Guide Supplement (Nov. 15, 2000) (North American voice over packet revenues estimated at $1.4 billion in 2000).

[144] *IDC Packet Switching Report* at Table 19.

[145] *Id*.

[146] *See Broadband 2001* at 124 ("GigE Internet access providers connect large enterprises, educational institutions, and small and medium enterprises in large office buildings (MTUs) to the Internet. . . . GigE players also offer LAN-LAN connectivity, also know as transparent LAN services (TLS), to medium and large enterprises. . . . GigE service providers offer wholesale MAN connectivity, providing the infrastructure for high-speed metro backbones.").

[147] *See* L. Cooper and T. Moore, *Corporate America Implementing New Gigabit Ethernet Strategies; Industry Trend or Event*, Communications News (Aug. 1, 2001) (citing Infotech Consulting).

[148] *Id.*

[149] *Broadband 2001* at 124.

[150] The FCC already has recognized in the past that "it is precisely in the provision of services like frame relay that competition is most intense, and we acknowledge the sensitivity of the LECs' position as they face increasing competition, especially regarding these services that are likely to be related to nonregulated and highly

provision of mass-market broadband services, companies other than the Bell companies are the primary providers of large business broadband services.[151]

The largest providers of both Frame Relay and ATM services are AT&T, WorldCom, and Sprint, which control more than two-thirds of the nationwide market for these services. *See* Figure 4.[152] The long distance carriers have vast nationwide Frame Relay and ATM networks. AT&T's domestic Frame Relay and ATM network has over 620 Points of Presence (POP), including multiple POPs in every Verizon state.[153] WorldCom's and Sprint's ATM and Frame Relay networks are similarly extensive.[154] As one analyst has noted, "[t]he Big 3 IXCs own the U.S. frame relay market, have scale economies and are best positioned to influence users and move the market."[155] AT&T indeed describes itself as "the market leader for frame relay service," and "the leading provider of reliable, high-performing [Frame Relay] networks for

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competitive services." *Policy and Rules Concerning Rates for Dominant Carriers*, Memorandum Opinion and Order, 8 FCC Rcd 7474, ¶ 63 (1993).

[151] As noted by industry analysts and CLECs alike, Bell companies are limited in their broadband offerings due to restrictions on the provision of interLATA services. *See, e.g.*, Stratecast Partners, *ATM and Frame Relay Market Assessment, Data/Internet Services Growth Strategies*, Vol. II, No. 10, at 12 (Sept. 2001) ("*Stratecast ATM/Frame Relay Report*") ("Thus far, the RBOCs have held a very small share of the frame relay market, primarily because they have only been allowed to offer intra-LATA services."); *Frost & Sullivan - New Demands for Capacity Increase Competition Among Packet Data Providers*, PR Newswire (Oct. 4, 1999) ("Because users can be exposed to a wide array of data access technologies, the ability to offer seamless, end-to-end service is becoming critical to winning new customers.") (quoting Isabelle Gallo, Frost and Sullivan Telecommunications Industry Analyst). *See also* WorldCom, *Metro Frame Relay Service*, http://www.worldcom.com/us/products/datanetworking/framerelay/metro (WorldCom's Metro Frame Relay service "offers an aggressive price position compared to that offered by LECs. LECs can offer local (intraLATA) service, but they aren't able to cross LATA boundaries or move into other Regional Bell Operating Company (RBOC) territories.").

[152] *See IDC Packet Switching Report* at Figures 9, 31 (AT&T, WorldCom, and Sprint together accounted for 65.8 percent of revenues for ATM, and 68.4 percent of revenues for frame relay in 2000); *Stratecast ATM/Frame Relay Report* at 10 ("Tier 1 service providers continue to dominate the U.S. market, controlling over 70% of the market."); *id*. at 17 ("In 2000, AT&T held the largest share of ATM service revenues, with a 36% share of [the] market; WorldCom and Sprint held the second and third leading position in the market with shares of 26% and 22%, respectively. As in the frame relay market, the RBOCs collectively represent a small share of the ATM services market.").

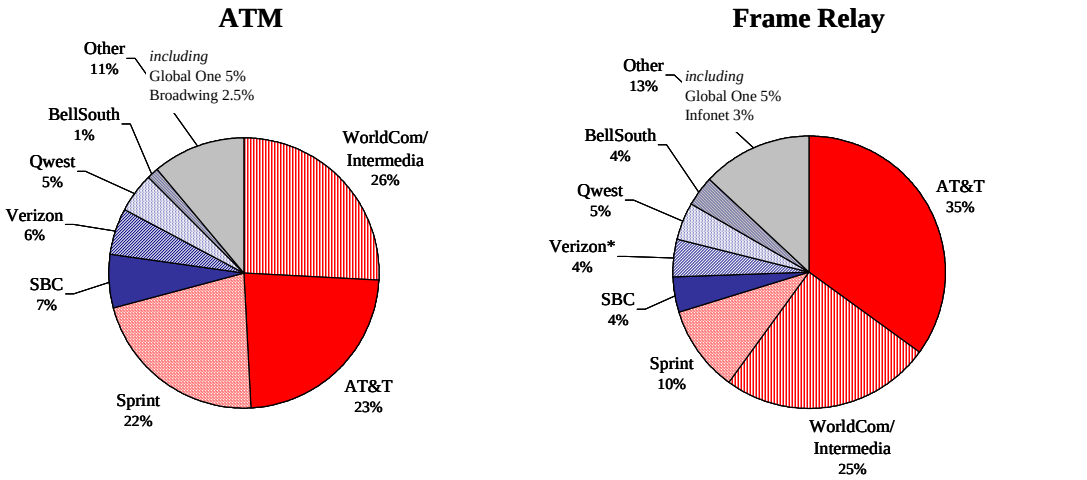
[153] AT&T Corp., *AT&T ATM Service, Brochure*, http://www.ipservices.att.com/products/productoverview.cfm?productid=atm.

[154] *IDC Packet Switching Report* at 137 (700+ POPs for WCOM); MCI WorldCom, Inc., *US Products, Data Networking, Frame Relay*, http://www.worldcom.com/us/products/datanetworking/framerelay/index.phtml (402 Frame Relay POPs); Sprint Corp., *Sprint Business, Dedicated Access, Service and Support*, http://www.sprintbiz.com/small_business/dedicated_ip/ (320 POPs).

[155] *Stratecast ATM/Frame Relay Report* at 12.

business customers."[156] WorldCom likewise claims that it "offers a portfolio of frame relay feature functionality that is virtually unmatched in the industry today."[157]

Figure 4. Market Share of ATM and Frame Relay Revenues



*Bell Atlantic share. GTE share included in "Other."

Source: R. Kaplan, IDC, *U.S. Packet/Cell-Based Services Market Forecast and Analysis, 2000-2005* at Figures 9 & 31 (2001).

Numerous other CLECs also provide ATM and Frame Relay service.[158] Nationwide, CLECs have deployed more than 2,500 packet switches.[159] Since the beginning of 1999, the number of CLEC packet switches has increased by more than 210 percent. And these CLECs also have deployed extensive fiber networks to connect these packet switches.[160] CLECs nationwide have deployed more than 300,000 route miles of fiber (both local and long-haul).[161]

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[156] AT&T Corp., *AT&T ATM Service, Brochure*, http://www.ipservices.att.com/products/productoverview.cfm?productid=atm; AT&T News Release, *AT&T Reports Precedent-Setting "Five Nines" Performance On Its Market-Leading Frame Relay Network* (July 24, 2000).

[157] WorldCom, *Data Networking, Frame Relay*, http://www.worldcom.com/us/products/datanetworking/framerelay/index.phtml.

[158] New Paradigm Resources Group, Inc., *CLEC Report 2002*, Ch. 6 (15th ed. 2002) ("*CLEC Report 2002*"); New Paradigm Resources Group, Inc., *CLEC Report 2001*, Ch. 13 (14th ed. 2001) ("*CLEC Report 2001*") (Adelphia, Allegiance, Alltel, Arbros, Birch Telecom, Choice One, Conectiv, CoreComm, Cox, CTC, Electric Lightwave, Focal Communications, Fibernet Telecom, Global Crossing, Globalcom, IP Communications, Lightyear, McLeodUSA, Metromedia Fiber Networks, Mpower, NEON Optica, NAS, New Edge Networks, NTELOS, NuVox, PacWest, Penn Telecom, Prospeed.net, TDS Metrocom, Telergy, Time Warner Telecom, TXU Communications, Telepacific, US LEC, and XO).

[159] *CLEC Report 2002*, Ch. 4 at Table 8.

[160] In Verizon East's region, there are at least 60 CLECs with more than 320 fiber networks in the 29 largest MSAs. *See CLEC Report 2002*; New Paradigm Resources Group, Inc., *CLEC Report 2001* (13th & 14th eds. 2001); New Paradigm Resources Group, Inc., *CLEC Report 2000* (11th & 12th eds. 2000).

[161] *CLEC Report 2001*, Ch. 4 at Table 13.

In Verizon's region, CLECs have deployed at least 280 packet switches (and perhaps many times that amount).[162] In Verizon East's territory (*i.e.*, the former Bell Atlantic region), at least 40 CLECs have deployed packet switches and are providing ATM and Frame Relay services. *See* Table 5.

Verizon also provides ATM and Frame Relay services, however, it is a relatively small player. According to IDC, Verizon accounts for only 4.2 percent of nationwide Frame Relay revenues, and only 5.6 percent of nationwide ATM revenues.[163]

Finally, there is extensive competition in the provision of new Gigabit Ethernet services. Competitive carriers are leading in the deployment of Gigabit Ethernet services.[164] As one analyst notes, "metro Ethernet services being aggressively marketed by companies such as Yipes[,] Time Warner Telecom, XO, and Telseon will impact the high-end of the ATM market in both retail and metropolitan wholesale applications."[165] Moreover, Gigabit Ethernet services are not only competitive in and of themselves, but these new services are increasingly providing competition to other packet switching services like ATM and Frame Relay. Analysts expect that "competition in the local ATM market will intensify, as alternative high-speed services such as metro Ethernet services gain traction with high-end customers and the IXCs continue pushing bundled offerings via their ATM-based convergence platforms."[166]

C. Large Additional Investment Is Needed in the Large Business Broadband Market.

The many facilities-based competitors in the large business broadband market ensure that there is more than adequate capacity at current levels of demand. But demand for broadband in the large business market is growing very quickly, and in order to satisfy this demand enormous new investment will be required. According to Insight Research, the current broadband network

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[162] *CLEC Report 2002*, Ch. 5.

[163] *See IDC Packet Switching Report* at Figures 9 & 32.

[164] *See, e.g.*, Yipes Communications, *Yipes Announces Nationwide Availability of Instantly Scalable Bandwidth* (Sept. 11, 2001) ("Yipes Communications, Inc. [is] the defining provider of optical Gigabit Ethernet networks"); Telseon Press Release, *Telseon Announces Service Promotion to Drive Metropolitan Gigabit Ethernet Service Adoption* (Apr. 24, 2001) (reporting successful adoption of GigE services: "As one of the GigE service leaders, Telseon is showing that speed and simplicity of deployment are possible in the metro optical network. . . . Given the cost, it is a low-risk way to evaluate the ROI.") (quoting George Peabody, Aberdeen Group, Vice President and Practice Manager, Communications Infrastructure and Services).

[165] *Stratecast ATM/Frame Relay Report* at 17. *See also* S.M. Milunovich, Merrill Lynch Capital Markets, Investext Rpt. No. 2779422, Tech Strategy; All's Not Quiet on the GIGE Front – Industry Report at *1 (Apr. 10, 2001) (Yipes Communications "has built a 20-city, all-optical, all-GigE network in less than two years," which "offers at least a 5-to-1 cost advantage versus IP over ATM/SONET."); S. Clavenna, *Metro Optical Ethernet*, Lightreading.com (Nov. 13, 2000), http://www.lightreading.com/document.asp? (Cogent Communications "has built a network around the sole proposition of providing 100-Mbit/s Ethernet services to tenants of office buildings for $1000 per month, roughly the price of a traditional T1 (1.5 Mbit/s) line."); D. Allen, *Will Gigabit Ethernet WAN Services Make Us Forget About SONET?*, Network Magazine (July 5, 2001) (Telseon has more than 120 Gigabit Ethernet POPs in 20 cities).

[166] *Stratecast ATM/Frame Relay Report* at 18.

consists of 40,000 broadband switches and routers, which handle an estimated 20,000 terabits per day of Internet traffic.[167] With such traffic doubling every year, Insight Research "estimates a whopping $50 billion dollars in new gear will be needed over the next five years or US Internet traffic will gradually grind to a halt."[168] Other analysts and companies make similar observations about the growth of data traffic.[169]

As with residential broadband, demand for large business broadband is expected to intensify as companies discover new applications that broadband makes possible. As one observer notes: "What are the new sources of demand? They are being created every day. As companies like Level 3 push down the cost of communications, more and more businesses are turning to the Internet to offer Web-based services that simply weren't economical before."[170]

III. REMOVING REGULATORY OBSTACLES TO ADDITIONAL BROADBAND INVESTMENT.

It is clear from experience that reducing regulatory impediments to the deployment of new facilities and granting equal regulatory treatment to all competing providers of comparable services greatly increases output.

This is exactly what has happened in the wireless industry. As is the case with broadband today, the early years of the wireless industry were characterized by a limited number of competitors, many of which faced extensive regulation that created an uneven competitive playing field. Until the 1990s, the Commission permitted only two wireless carriers in every geographic market.[171] Between 1984 (the year the first cellular system became operational) and 1990, cellular subscribers grew by an average of only 865,000 subscribers per year. By 1990,

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[167] Insight, *ATM, IP, and Broadband Switching 2001-2006* (2001).

[168] Insight, *ATM, IP, and Broadband Switching 2001-2006* (2001). *See id.* ("Insight expects the number of broadband switches and routers to almost triple, at the same time as the throughput capacity per switch increases by a factor of 25. Essentially all of the 2006 switches used in distribution and backbone packet networks will be new, and the aggregated investment will amount to almost $50 billion, the report says."); *id.* ("Our analysis suggests that over the next five years a tremendous investment in switching systems will be required or the network will choke on its own traffic-and we just don't believe that is going to be allowed to happen.").

[169] *See, e.g.*, CiDRA, *About CiDRA: Marketplace Conditions and Challenges*, http://www.cidra.com/about/marketplace.html ("RHK predicts that the transmission of data traffic will jump from 350,000 terabytes per month in 1999 to more than 16 million terabytes per month in 2003."); Int'l Engineering Consortium, *Convergent Networks Online Tutorial: Convergence Switching and the Next-Generation Carrier*, http://www.iec.org/online/tutorials/con_switch/topic02.html ("The explosive growth of data traffic also forced carriers to expand their data network infrastructures constantly. The growth has been so rapid that companies such as MCIWorldCom experience annual data backbone growth rates of roughly 800 percent, while voice traffic, by comparison, grows at only 4 percent worldwide.").

[170] *Id.*

[171] *An Inquiry into the Use of the Bands 825-845 MHz and 870-890 MHz for Cellular Communications Systems*, Report and Order, 86 FCC2d 469, 509 ¶ 97 (1981).

there were only 5.3 million cellular subscribers in the country. During this same six-year period, wireless investment averaged less than $1 billion per year.[172]

Things first began to change in 1991, when Fleet Call (now known as Nextel) persuaded the FCC to permit it to use spectrum previously used mostly for dispatching taxis to provide digital wireless telephone service.[173] Between 1991 and 1993, wireless subscribers grew by 3.6 million per year, and investment grew by an average of $2.6 billion per year. In 1993, Congress passed the Omnibus Budget Act of 1993, which preempted most state regulation of wireless, and required the Commission to regulate all commercial wireless services in a similar manner.[174] In 1994, the Commission began auctioning off licenses for up to five new wireless providers in most markets, after declaring that these new providers should be subject to "minimal regulation."[175] Between 1993 and 1996, wireless subscribership grew by an average of 9.3 million per year, and wireless investment grew by an average of $6.2 billion per year. In 1996, Congress removed the interLATA restriction on BOC wireless services, the last significant remaining restriction separating BOCs and other wireless participants. In the first five years after the Act, wireless subscribership and investment has grown by an average of 16.4 million per year, and wireless investment has grown by an average of $14 billion per year. Net additions and investment during these past four years have indeed been higher than in any previous four-year period. *See* Figure 5.

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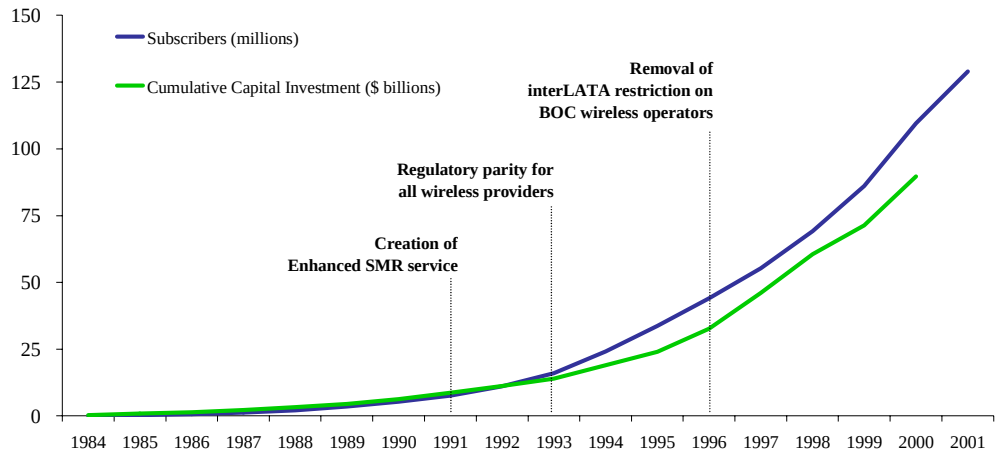
[172] CTIA, *CTIA's Semi-Annual Wireless Industry Survey Results*, http://www.wow-com.com/industry/stats/articles.cfm?ID=239.

[173] *Request of Fleet Call Inc. for a Waiver and Other Relief to Permit Creation of Enhanced Specialized Mobile Radio System in Six Markets*, Memorandum Opinion and Order, 6 FCC Rcd 1533 (1991). The FCC later adopted certain technical modifications to these dispatch licenses that increase their capacity even further. *Co-Channel Protection Criteria for Part 90, Subpart S Stations Operating Above 800 MHz*, Report and Order, 8 FCC Rcd 7293 (1993).

[174] The Omnibus Budget Reconciliation Act of 1993 amended Section 332 of the Communications Act of 1934 to require that all commercial mobile service be treated as common carrier and that the Commission may forbear from applying Title II regulation if consistent with the public interest. Pub. L. No. 103-66, Title VI, § 6001(a) 107 Stat. 312 (1993). According to the legislative history, Section 332 was amended to ensure that "services that provide equivalent mobile services are regulated in the same manner." H.R. Rep. No. 103-111, 103d Cong., 1st Sess. 259 (1993) (footnotes omitted). *See also* H.R. Conf. Rep. No. 213, 103d Cong., 1st Sess. 494 (1993) (noting the overall intent of state preemption section was to ensure that "similar services are accorded similar regulatory treatment.").

[175] *Amendment of the Commission's Rules To Establish New Personal Communications Services*, Memorandum Opinion and Order, 9 FCC Rcd 4957, ¶ 10 (1994); *Amendment of the Commissioner's Rules to Establish New Personal Communications Services*, Notice of Proposed Rulemaking and Tentative Decision, 7 FCC Rcd 5676, ¶ 94 (1992).

Figure 5. Effects of Deregulation in the Wireless Market



Sources: See Appendix.

Developments in information-services markets have been similar. Since Bell companies were permitted to compete on equal footing in this market,[176] competition has thrived, and investment has grown. Since Bell company entry, the voice-messaging industry, for example, has grown at double-digit rates and monthly service fees have dropped significantly.[177] Growth has been even more explosive in Internet access. Today there are more than 7,000 Internet service providers,[178] and some of the largest providers now charge no monthly fees, in exchange for customer acceptance of advertising.[179] The deregulation of computers and other customer premises equipment resulted in rapidly falling prices for information technology which, together with the development of the Internet, fueled a spectacular rise in productivity growth that led to the longest economic expansion in U.S. history.[180]

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[176] *See Computer III Further Remand Proceedings: Bell Operating Company Provision of Enhanced Services 1998 Biennial Regulatory Review of Computer III – ONA Safeguards and Requirements*, Further Notice of Proposed Rulemaking, 13 FCC Rcd 6040, ¶ 5 (1998).

[177] *See* J.A. Hausman and T.J. Tardiff, *Benefits and Costs of Vertical Integration of Basic and Enhanced Telecommunications Services* at 14, *attached to* Comments of Bell Atlantic, *Computer III Further Remand Proceedings: Bell Operating Company Provisions of Enhanced Services*, CC Docket No. 95-20 (FCC filed Apr. 7, 1995).

[178] *See Boardwatch Magazine's Directory of Internet Service Providers* at 4 (13th ed. Spring 2001).

[179] NetZero, an ISP, offers such a service with no monthly fees. "NetZero relies on ad revenues and e-commerce royalties to earn its daily bread," and "boasts a subscriber base approaching that of the combined EarthLink-MindSpring." *See* M. Popper, *Fee or Free: Which ISP Model Will Win on Wall Street?*, Business Week, http://www.businessweek.com/bwdaily/dnflash/jan2000/sw00126.htm.

[180] *See, e.g.*, Alan Greenspan, Chairman, Federal Reserve Board, *Structural Changes In the Economy and Financial Markets*, remarks before the America's Community Bankers Conference, New York (Dec. 5, 2000) ("Technological innovation, and in particular the spread of information technology, has revolutionized the conduct of business over the past decade and resulted in rising rates of productivity growth. Accelerated productivity has been elevating standards of living, and it has been containing cost and price pressures, even as the economy operates at unusually high levels of labor resource utilization."); J. Oxman, *The FCC and the Unregulation of the Internet* at 14, Office of Plans and Policy, OPP Working Paper No. 31 (July 1999) ("Most important for the growth and

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development of the Internet, the Commission's deregulation of customer premises equipment, or CPE, cleared the way for the rapid deployment of the modem"); R. Gordon, *What Productivity Miracle*, IT World (Apr. 15, 2001), http://www.itworld.com/Tech/2336/ CIO010415productivitycon/ ("The price of computer power . . . declined more than 30 percent a year from 1995 to 1998, double the 10 percent to 15 percent decline in price before 1995. Combined with this technological acceleration was the invention of Web browsers and widespread access to the Internet. Taken together, the invention of the Web and the rapid decline in computer prices spurred a massive wave of investment in computers, peripherals and software."); *see generally* Robert W. Crandall & Charles L. Jackson, Criterion Economics, L.L.C., *The $500 Billion Opportunity: The Potential Economic Benefit of Widespread Diffusion of Broadband Internet Access* (July 2001).

Table 5. CLECs Providing ATM and Frame Relay in Verizon East's Region	
CLEC	***Service:* Market**
Adelphia	***ATM/Frame Relay:*** Boston, MA
Allegiance	***ATM:*** Baltimore, MD; Boston, MA; New York and White Plains, NY; Newark and Rutherford, NJ; Philadelphia, PA; Washington, DC
Arbros	***ATM/Frame Relay:*** Washington, DC; Boston, MA; Baltimore and Landover, MD; Newark, NJ; New York, NY; Harrisburg, Philadelphia and Pittsburgh, PA; Alexandria, Arlington and Richmond, VA
AT&T	***ATM/Frame Relay:*** Washington, DC; Boston, MA; Baltimore, MD; Newark, NJ; New York, NY; Philadelphia and Pittsburgh, PA; Providence, RI; Alexandria, VA
ATG	***ATM:*** Frederick, Gaithersburg, Hagerstown, Rockville and Towson, MD; Fairfax, VA
Broadslate	***ATM:*** Allentown and Harrisburg, PA; Richmond and Tidewater, VA
Broadview	***ATM:*** Boston, MA; New York, NY; Horsham and Philadelphia, PA
BTI	***Frame Relay:*** Philadelphia, PA; Richmond, VA
Cablevision Lightpath	***Frame Relay:*** Bayville, Bethpage, Brooklyn, Strongsville and Yonkers, NY
Choice One	***ATM/ Frame Relay:*** Springfield and Worcester, MA; Portsmouth and Manchester, NH; Albany, Buffalo, Rochester and Syracuse, NY; Allentown, Harrisburg, Pittsburgh and Scranton, PA; Providence, RI
Comcast Business Communications	***Frame Relay:*** Anne Arundel County and Prince George's County, MD; Alexandria and Prince William County, VA
Conectiv	***ATM/Frame Relay:*** Dover, Marshallton, New Castle, Newark and Wilmington, DE; Bel Air, MD; Pennsville, NJ. ***Frame Relay:*** Norristown, MA; Annapolis, Baltimore, Easton and Salisbury, MD; Atlantic City, Camden, Pleasantville, Princeton and Trenton, NJ; Downingtown, Harrisburg, Kennett Square, King of Prussia, Lancaster, Paoshi, Valley Forge and West Chester, PA
CoreComm (ATX)	***ATM/Frame Relay:*** Camden, NJ; Philadelphia, PA
Cox	***ATM/Frame Relay:*** Providence and West Warwick, RI; Hampton Roads and Roanoke, VA
CTC	***ATM/Frame Relay:*** Boston, Braintree, Danvers, Lexington, Manchester, Marlboro, North Attleboro, Springfield, Waltham and West Springfield, MA; Baltimore, MD; Bangor and Portland, ME; Bedford, NH; Albany, Elmsford, Melville, Nanuet, New York, Syosset and Yorktown Heights, NY; Burlington, VT
CTSI	***ATM:*** Harrisburg and Wilkes-Barre, PA
Electric Lightwave	***ATM/Frame Relay:*** Washington, DC
Fairpoint	***ATM:*** Washington, DC; Springfield, MA; Augusta, ME; Lebanon and Manchester, NH; East Greenbush, New York and Yakim, NY; Bloomsburg, Erie, Hazelton, Lock Haven and Williamsport, PA; Morgantown, WV
Fibernet Telecom	***ATM/Frame Relay:*** New York, NY
Focal	***ATM:*** Washington, DC; Boston, MA; Baltimore, MD; New Brunswick, Newark and Rochelle Park, NJ; New York and White Plains, NY; Philadelphia, PA; Arlington and northern Virginia, VA
Global Crossing	***ATM/Frame Relay:*** Washington, DC; Boston, MA; Baltimore, MD; New York and Rochester, NY; Philadelphia and Pittsburgh, PA
Globalcom	***ATM/Frame Relay:*** New York, NY
Lightship Telecom	***Frame Relay:*** Waltham and Worcester, MA; Portland, ME; Atlantic County and Mercer County, NJ; Buck County, Chester County and Montgomery, PA; Burlington, VT
Lightyear	***ATM/Frame Relay:*** Boston, MA; Baltimore, MD; Newark, NJ; New York, NY
Log On America	***Frame Relay:*** Portland, ME; Providence, RI
Metromedia	***ATM/Frame Relay:*** Washington, DC; Wilmington, DE; Bedford, Boston, Cambridge, Medford, Waltham, Wellesley and Woburn, MA; Bethesda, Chevy Chase, College Park, Rockville and Silver Spring, MD; Garden City, Morristown, New Brunswick, Newark, Paramus, Parsippany, Piscataway, Princeton and Whippany, NJ; Brookhaven, Hauppage, Long Island, New York, Nyack, Shirley and White Plains, NY; Bala Cynwyd, King of Prussia, Malvern, Paoli, Philadelphia and Radnor, PA; Alexandria, Arlington, Fairfax, McLean, Reston, Tyson's Corner and Vienna, VA

Table 5. CLECs Providing ATM and Frame Relay in Verizon East's Region	
CLEC	***Service:* Market**
Mid-Maine	***Frame Relay:*** Auburn, Augusta, Bangor, Brewer, Cumberland, Ellsworth, Lewiston, Lincoln Counties, Portland, Sagadahoc, Waterville and York, ME
NEON Optica	***ATM/Frame Relay:*** Washington, DC; Boston, Cambridge, Framingham, Lawrence, Northfield, Springfield and Worcester, MA; Baltimore, MD; Portland, ME; Dover, Keene, Manchester, Nashua and Portsmouth, NH; Newark, NJ; New York and White Plains, NY; Philadelphia, PA; Green Hill and Providence, RI.
NAS	***ATM/Frame Relay:*** Washington, DC; Boston, MA; Baltimore, MD; New York, NY; Philadelphia and Pittsburgh, PA; Norfolk and Richmond, VA
Northland	***Frame Relay:*** Auburn, Binghamton, Elmira, Ithaca, Rochester, Rome, Syracuse and Utica, NY
NTELOS	***ATM/Frame Relay:*** Harrisonburg, Lynchburg, Martinsville, New River Valley, Roanoke, Staunton and Waynesboro, VA; Charleston, Clarksburg, Fairmont, and Morgantown, WV. ***Frame Relay:*** Huntington, WV
Penn Telecom	***ATM/Frame Relay:*** Butler, Cranberry, Gibsonia, Perrysville, Pittsburgh and Sewickley, PA
Prospeed.Net	***ATM/Frame Relay:*** Lowell, MA
SBC Telecom	***ATM:*** Washington, DC; Boston, MA; Baltimore, MD; Bergen-Passaic, Middlesex and Newark, NJ; Buffalo, Nassau-Suffolk and New York, NY; Philadelphia, PA; Norfolk, VA
Telergy	***ATM/Frame Relay:*** Boston, MA; Albany, Batavia, Binghamton, Buffalo, Glens Falls, Ithaca, New York, Oswego, Poughkeepsie, Rochester, Syracuse, Utica and Watertown, NY; Erie, PA
Time Warner Telecom	***ATM:*** Jersey City, NJ; Albany, Binghamton, New York and Rochester, NY
US LEC	***ATM/Frame Relay:*** Philadelphia and Pittsburgh, PA; Norfolk, Richmond, VA. ***ATM:*** Washington, DC; Virginia Beach, VA
WorldCom	***ATM/Frame Relay:*** Washington, DC; Acton, Boston, Cambridge and Springfield, MA; Manchester and Nashua, NH; Laurel Springs and Newark, NJ; Buffalo, Manhattan, Westbury and White Plains, NY; King of Prussia, Pittsburgh and Philadelphia, PA; Providence, RI; Reston, VA
XO	***ATM:*** Washington, DC; Boston, MA; Baltimore, MD; New York, NY; Philadelphia, PA
Source: New Paradigm Resources Group, Inc., *CLEC Report 2002*, Ch. 6 (15th ed. 2002); New Paradigm Resources Group, Inc., *CLEC Report 2001*, Ch. 13 (14th ed. 2001).	

APPENDIX: ADDITIONAL SOURCES

Table 1. Functional Similarity of Residential Broadband Services
G. Keizer, *The Broadband Breakdown*, CNET.com (Oct. 2, 2001), http://www.cnet.com/internet/0-3762-8-7287680-1.html?tag=st.is.3761-0.boxhl.3762-8-7287680-1; ibuybroadband.com, *Broadband 101 - Everything You Need to Know About Broadband*, http://www.ibuybroadband.com/ibb2/knowledge.asp; R. Shah, *Analysis: The Next Great Net Connection*, CNN.com (Aug. 23, 2000), http://www.cnn.com/2000/TECH/computing/08/23/next.great.connection.idg/; StarBand Communications Inc., *What Is Starband?*, http://www.starband.com/whatis/index.htm; D. Johnson, *Fixed Wireless Oft-neglected Service Option*, ITWorld.com (Sept. 5, 2001), http://www.itworld.com/nl/wireless_watch/09052001/.

Table 3. Availability of Broadband Services
McKinsey/JP Morgan estimates. McKinsey & Co. and JP Morgan H&Q, *Broadband 2001* at Tables 1, 6, 7, 8 (Apr. 2, 2001). ***Yankee Group estimates.*** M. Goodman, Yankee Group, *Residential Broadband: Cable Modems and DSL Reach Critical Mass*, Media and Entertainment Strategies, Vol. 5, No. 3 at Exh. 4 (Mar. 2001); M. Davis, Yankee Group, *2001 DSL Subscriber Forecast* at 2, E-Networks and Broadband Access (July 2001). ***Satellite estimate.*** DirecPC, *Comparisons*, http://www.direcpc.com/index2.html; StarBand, *Q&A; What is StarBand Service*, http://www.starband.com/faq/starbandfacts.htm#service; Yankee Group, *Residential Broadband: Competition Arrives Via Satellite*, Media and Entertainment Strategies, Vol. 4, No. 18 at 4 (Dec. 30, 2000); StarBand, *Q&A*, http://www.starband.com/faq/starbandfacts.htm#available. ***Fixed Wireless estimate.*** D. Whipple, *Fixed Wireless Increases Broadband Access*, Interactive Week (March 20, 2001), http://www.zdnet.com/zdnn/stories/news/0,4586,2698833,00.html; J. Bazinet & D. Pinsker, JP Morgan H&Q, *The Cable Industry* at Table 2 (Nov. 2, 2001).

Table 4. Comparison of Broadband and Dial-up Download Times
Digital Photograph. EdTech, *Photoshop Tips, Photoshop: Tips for Image Size and Cropping Photos from a Digital Camera*, http://edtech.sandi.net/support/photoshop/. ***A Tale of Two Cities.*** eBooks.com, *Items, A Tale of Two Cities*, http://www.ebooks.com/items/item-display.asp?IID=3406. ***Five minute song.*** *See* MP3.com, *Music, Classical, Theodolos Annelise*, http://artists.mp3s.com/artists/76/theodolosannelise.html. ***Video clip.*** *See* Dell Corp., *Home and Home Office, Dell Movie Studio, Technology Brief*, http://www.dell.com/us/en/dhs/topics/segtopic_dms_studio_tech.htm. ***Titanic.*** Amazon.com, *Video, Titanic, Technical Information*, http://www.amazon.com/exec/obidos/tg/stores/detail/-/video/0792151712/tech-info/ref=pm_dp_ln_v_2/002-5678405-2337666; *Video Shrink with MP4*, BBC News (June 8, 2000), http://news.bbc.co.uk/hi/english/sci/tech/newsid_774000/774615.stm.

Figure 5. Effects of Deregulation in the Wireless Market
CTIA, *CTIA's Semi-Annual Wireless Industry Survey Results, June 1985 to June 2001*, http://www.wow-com.com/pdf/wireless_survey_2000a.pdf; CTIA, *CTIA's World of Wireless Communications*, http://www.wow-com.com (131,370,173 current wireless subscribers as of February 20, 2002).